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OCTOBER 1990
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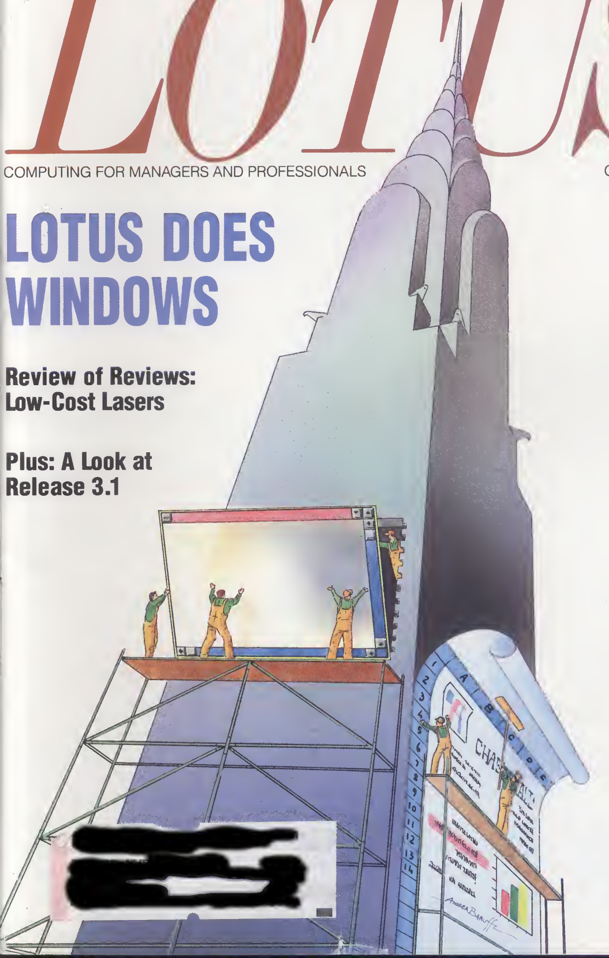

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VOLUME 6

LOTUS

NUMBER 10

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STAFF LETTER

Windows: Closer to an Ideal, But Not There Yet

Forget any notion of attaining nirvana immediately by using the much-hyped *Microsoft Windows* 3.0 graphical user interface environment for DOS. "I can see how it will help users, but they shouldn't expect full functionality right away," says Associate Editor Phyllis Sharon, after more than a month of using *1-2-3* and *Symphony* with *Windows*. "Users must overcome a lot of technical hurdles."

Sharon is part of the team that prepared our article on how to run the various versions of *1-2-3* in *Windows* (it begins on page 34). The team's conclusion, according to Nicholas Delonas, *LOTUS* macros editor and a member of the *Windows* team, is that "*Windows* does make life easier, but there is a transition period."

In fact, Nick is much more enthusiastic about the spreadsheet-publishing features of the newest member of the *1-2-3* family, the just-released *Windows*-compatible version 3.1. He contends that the spreadsheet-publishing capabilities of Release 3.1 are more valuable than the graphical user interface and other *Windows* attributes. "You can use eight fonts in one spreadsheet, and import graphics and metafiles without leaving the worksheet."

ANN M. MARCUS

LOTUS's Macros Editor Nick Delonas and Associate Editor Phyllis Sharon

So, in the never-ending attempt to make computers easier to use, *Windows* 3.0 is an important milestone. But it is not the ultimate solution.

Speaking of ease of use, this issue of *LOTUS* has a number of new features that make it more usable. Readers' number-one request to *LOTUS* is for a disk version of our models and macros. This month we deliver. Turn to page 16 for information on how to order your disk. In addition, we're offering a disk-based index of the magazine (page 97).

You've probably noticed several other changes to *LOTUS*. We've switched to a binding called saddle stitching. The staple allows the magazine to lie flat when open and makes it easier to remove articles for filing. And to be kinder to the environment, we're no longer shipping the magazine in a plastic bag.

Larry Marion
Editor-in-Chief

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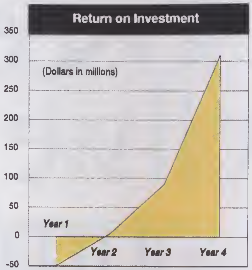
To see how well we crunch numbers, look at our graphics.

Microsoft Excel for Windows.

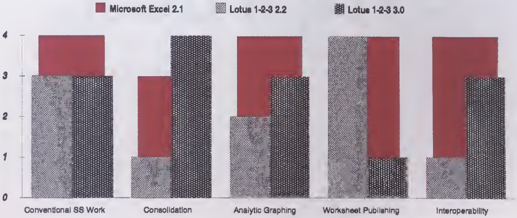
> *"With solid spreadsheet and charting components and a comprehensive macro language integrated into a powerful graphical environment, Excel is no more 'just a spreadsheet' than a Ferrari or a Porsche is 'just a car.'"* **PC Magazine**

Recently, *PC Magazine* placed Microsoft Excel version 2.10 head to head with Lotus 1-2-3 release 2.2 and 3. They measured the essential criteria by which spreadsheets are judged. As you can see from the chart, Microsoft Excel proved to be superior in its balance of capabilities. Further evidence of the advantages of the graphical-based Microsoft Excel over the character-based Lotus 1-2-3 can be seen in a recent study.



*Based on the findings of a recent study, switching to graphical applications can yield increased productivity and can result in these dollar savings. ****

Over the years, graphical-based applications result in significant dollar savings since they are faster to learn, faster to use and less frustrating to master.



In this chart, PC Magazine*** compares the salient spreadsheet criteria of Microsoft Excel and Lotus 1-2-3. As you can see, Microsoft Excel showed its superiority.*

(Incidentally, this report was created using Microsoft Excel linked with Microsoft Word for Windows.)

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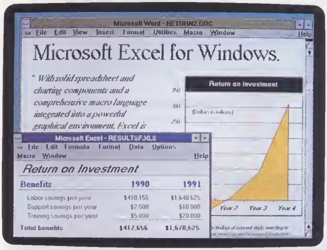
If you read the report at the left, you can see in just a couple of seconds how well Microsoft® Excel for Windows™ can crunch numbers.

Which is exactly our point.

Whatever analytic case you're making, it's much more easily made with a comprehensible, bottom-line report than with a row and column spreadsheet.



Microsoft Word - RETURN2.DOC

Microsoft Excel for Windows.

" *With solid spreadsheet and charting components and a comprehensive macro language integrated into a powerful graphical environment, Excel is*

File Edit View Insert Format Utilities Macro Window Help
Return on Investment
(Dollars in millions)
350
300
250
Year 2
Year 3
Year 4

Microsoft Excel - RESULTSF.XLS

File Edit Formula Format Data Options Macro Window Help

Return on Investment

Benefits	**1990**	**1991**
Labor savings per year	$410,156	$1,640 625
Support savings per year	$2 500	$10 000
Training savings per year	$5 000	$20 000
Total benefits	**$417,656**	**$1,670,625**

Windows can display Microsoft Excel and Word for Windows at the same time so you can see how all elements of your analysis will go together.

And that's not to give up one iota of analytic power.

Fact is, Microsoft Excel gives you more power to make sense of numbers than any other spreadsheet going. Simply because whether you're analyzing or reporting, you get the power of the Microsoft Windows environment every step of the way.

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And consider it done.

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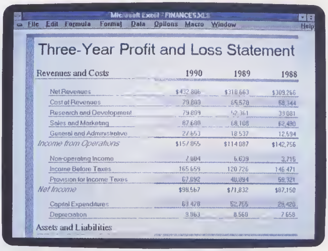

Microsoft Excel - FINANCESF.XLS

Three-Year Profit and Loss Statement

Revenues and Costs	**1990**	**1989**	**1988**
Net Revenues	$432 806	$318 663	$309,266
Cost of Revenues	79 889	65,578	58,344
Research and Development	79 809	52 361	33 081
Sales and Marketing	87 688	68,108	62,490
General and Administrative	27 653	18 537	12,594
Income from Operations	$157 055	$114 087	$142,756
Non-operating Income	7 804	6,639	3,715
Income Before Taxes	165 659	120 726	146 471
Provision for Income Taxes	67,092	48,894	59,321
Net Income	$98,567	$71,832	$87,150
Capital Expenditures	63 478	52,755	29,420
Depreciation	9 863	8 560	7 658
Assets and Liabilities			

Under the Windows environment, WYSIWYG lets you see exactly how your work will print out while you're creating it.

Then when you want to pull out all the stops, you can easily create full-blown reports that mix text, graphics and data. Just copy and paste using other Windows applications, like Word for Windows.

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*mmunications Company ***"The Benefits of the Graphical User Interface" prepared Spring 1990, by Temple, Barker & Sloane, Inc*

LETTERS

CHALLENGING THE CHALLENGES

"Four Spreadsheet Challenges" (May, page 56) triggered an outpouring of mail from readers. Larry Roshfeld, the author of the article, and the editors of *LOTUS* were gratified by the creative responses of scores of readers. A summary of their ideas follows.

SHORTCUTS TO SOLVING CHALLENGE 1

Challenge 1 used @DATE, @IF, @MONTH, and @YEAR to devise a formula that, given a start date of November 12, 1990, calculates how many days remain in a fiscal year that ends September 30. The author offered the following solution:

```
@IF(@MONTH(A1)>9,
  @DATE(@YEAR(A1)+1,9,30)–A1,
  @DATE(@YEAR(A1),9,30)–A1)
```

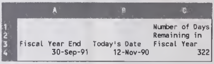
I devised an alternative that is half as long:

```
@DATE(@YEAR(A1)
  +(@MONTH(A1)>9),9,30)–A1
```

John Haynes
Chapel Hill, N.C.

The author replies: Mr. Haynes's solution to the problem is clearer and more elegant.

The solution to the first challenge was much more complicated than necessary. @DATE values can be used in equations the same way any number can be used. Why bother with a lengthy equation using @IF, @MONTH, and @YEAR? The following solution is sufficient:



```
          A                B               C
1                                   Number of Days
2                                   Remaining in
3 Fiscal Year End   Today's Date    Fiscal Year
4          30-Sep-91       12-Nov-90            322
```

In this solution, cell A4 contains the formula @DATE(91,9,30), cell B4 contains the formula @DATE(90,11,12), and cell C4 contains the formula +A4–B4. Also, range A4..B4 is assigned the Date 1 format.

Greg Steiner
Appleton, Wis.

The editor replies: Your solution is indeed simpler than the author's. However, his solution allows readers to learn to use @DATE functions and logic to construct a formula.

A SIMPLER SOLUTION TO CHALLENGE 2

The solution that uses the @SUM formula seems to be the preferable method for the second challenge. However, in the real world, nobody needs a computer to rank four quantities. Consider applying this method to a set of 400 values rather than four. It would require 400 @SUM formulas, each with 399 less-than comparisons that must be entered manually, not copied, as noted in the article. Do you still believe the @SUM formula is simpler and easier? The macro seems by far the most

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Q&A and Good Ideas. Send submissions to Carrie Thomas, technical editor.

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CIRCLE 102 ON READER SERVICE CARD

practical and realistic of the solutions.

Marvin Cooper
Skokie, Ill

The author replies: The point of the challenge was to suggest that often there are alternatives to macros in resolving spreadsheet problems. Many people are not skilled in creating and using macros.

The formula that solved the challenge of ranking items in a list, @SUM(C2<C3,C2<C4,C2<C5,1), is too complex and requires reentering a variation of the formula for each item's ranking. My formula is easier to use, though it is a little longer:

@SUM(C2<C$2,C2<C$3,C2<C$4,C2<C$5,1)

The problem with both formulas is that whenever two numbers are identical, they are given the same ranking.

Jill Barnhart
Oswego, N.Y

A DIFFERENT APPROACH TO SOLVING CHALLENGE 3

To obtain the interest and principal for the first year of a loan, begin by finding the first-year balance, which is the present value of the remaining payments. The formula is:

@PV(*pmt*,*rate*/12,(*n*–1)*12)

The argument *pmt* is the amount of the monthly payment, *rate* is the annual interest rate, and *n* is the full term in years. Once the first-year balance is obtained, the first-year principal is just the original principal minus the first-year balance. The first-year interest is 12 times *pmt* minus the first-year principal.

The principal balance on any loan of equal payments can be obtained by finding the present value of the original payments at the original loan rate.

This approach eliminates the need for an amortization schedule to determine annual interest and principal reductions.

John Bigness
John Bigness and Co.
East Greenbush, N.Y.

The author replies: Some *1-2-3* users do not have a background in finance and are not familiar with the financial @functions. I wanted to provide an approach to handling loans and mortgages that was general and easy enough to be used by a broad spectrum of spreadsheet users. In addition, creating an amortization table allows the user to customize the solution further. For example, a person can easily calculate such items as the interest paid per month or the principal on a given date.

LINK STILL MISSING?

The advantages of *1-2-3* Release 3's file-linking capabilities, as covered in "Here's the Missing Link" (February, page 34), are overrated.

My coworkers and I tried to consolidate 24-month cash flows for 40 properties by using Release 3's file-linking capabilities. We created a consolidation file with more than 5,000 links to 40 individual property files. We discovered, however, that the Link-Refresh process took more than an hour to complete because it works cell by cell as opposed to range by range. We finally reverted to a File Combine approach from earlier *1-2-3* releases and found that the job could be done in one-tenth the time. Thus, the usefulness of Release 3's file-linking capabilities appears to be limited to relatively small amounts of data. Readers who have to perform large consolidations might be better advised to continue to use File Combine commands.

Sullivan C. Richardson
Hopkins Development Co.
Newport Beach, Calif.

The author replies: The design and the size of the application directly affect the speed at which *1-2-3* recalculates linked cells. For example, if links are to a file stored on disk, the Link-Refresh process will be lengthy. Also, if linked files are large—requiring more than 100K of RAM, for example—then the Link-Refresh will be slow.

……

@ERR

……

In the For Developers column in the July issue, figure 5 (page 28) and figure 7 (page 29) contain errors. In both cases, the string *to* should appear in place of the dashes, as in figure 1. For example, the statement {CONTENTS price_1-5b,price_1-5,11,2} in cell D35 should read {CONTENTS price_1to5b,price_1to5,11,2}.

……

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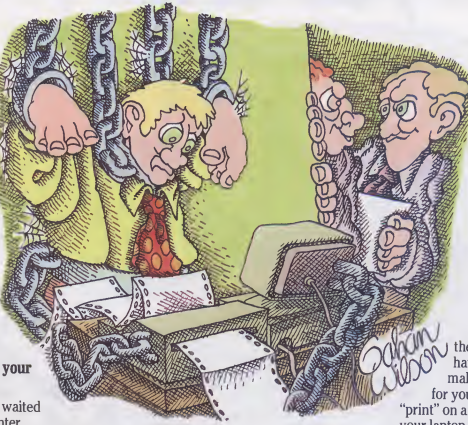

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CIRCLE 103 ON READER SERVICE CARD

Coming to a Desktop Near You: UNIX

With a boost from inexpensive workstations and popular applications

For the better part of five years now, the Unix operating system has been a coming attraction in the theater of personal computing. Soon, Unix may finally be playing on a PC in your area, maybe even on your own PC.

Recently the Santa Cruz Operation (SCO), a software-development company, announced that it would work with AT&T and Intel Corp. to develop a new version of the Unix operating system for personal computers based on Intel's 80386 microprocessor. IBM, Compaq, Tandy, and other manufacturers use Intel's chips. The agreement has the support of both Unix International and the Open Software Foundation, two computer industry consortia that are working to promote Unix standards.

Traditionally, Unix has been a popular-operating system among midrange systems. With personal machines, however, it has managed to capture only a couple of relatively minor niches. For example, many technical professionals, such as engineers and designers, use Unix on their high-powered, high-priced workstations. And small businesses often use it to set up an inexpensive multiuser system, typically consisting of one PC with several terminals cabled to it so that they can share database or accounting software.

But now Unix is a more serious contender for a place in the desktop derby. Two big reasons: Machines that can run Unix are getting cheaper and also becoming easier to use. Sun Microsystems, for example, recently introduced the SPARCstation SLC, a swift, Unix-based workstation that, at $3,995 to $6,695, sets new price/performance standards. The SLC also sports a graphical interface that makes Unix and its applications intelligible to nontechies.

Unix's case has been bolstered further by the migration of several popular DOS applications, including such market leaders as *1-2-3* and *WordPerfect*. Currently, Lotus Development Corp. offers a trio of *1-2-3* products for Sun workstations plus a new version for SCO's Xenix and Unix packages for PCs. For companies that use these applications, the Unix versions can ease the transition from one platform to another.

"Now we can go into a business and not only offer to solve their accounting problems but also offer them known quantities like *1-2-3* and *WordPerfect*," says Don Morrison, director of marketing for SCO. "That way, the customer doesn't feel like he's giving up some personal productivity tools to get what he needs."

FOR BUSINESSES THAT NEED MULTITASKING NOW, UNIX IS AN ATTRACTIVE INVESTMENT.

Faster than a speeding bullet. But why would PC users, long accustomed to using DOS, adopt Unix? Sheer speed, for one thing. Sun's new SLC workstations can process 12.5 million instructions per second–roughly twice the raw computing speed of comparably priced PCs. For users of speed-thirsty applications such as *1-2-3*, that's like leaving a 55-mph turnpike for the no-speed-limit autobahn.

1-2-3 runs three to four times faster on Sun's Unix platforms than it does on a mainstream DOS-based PC, says Chris Wraight, product marketing manager for *1-2-3 for Sun*. And because *1-2-3 for Sun* looks and feels just like the DOS-based *1-2-3* Release 3, you won't have to adjust to a new vehicle. "It's not *like 1-2-3*," notes Wraight. "It *is 1-2-3*."

All that speed, coupled with Unix's capacity for juggling its processing priorities, also makes for very efficient multitasking–something DOS has struggled with for years. For businesses that need multitasking now, Unix is an attractive investment. Many brokerage firms, for example, have switched from DOS-based PCs to Unix workstations so that brokers can receive a steady stream of financial-market quotes on their systems as they work on other things. That sort of problem-driven approach to buying new equipment will help propel Unix onto more desktops, say some observers.

Twenty years of evolution. Unix's strongest selling point on the desktop, though, may be its superior networking capabilities. Because Unix was designed as a multiuser operating system and refined for more than 20 years in large computer networks, it's ready to meet the demands of businesspeople who want better ways to share information.

"You don't buy a Sun workstation just to run PC applications," says Paul Cubbage, who tracks Unix developments for Dataquest, a market research firm in San Jose, Calif. "You buy a Sun workstation because you want to move from islands of productivity to a completely connected environment, and PC solutions to networking on a large scale aren't that good."

"It's not a box-by-box decision," agrees

COMING SOON!

JULIA TALCOTT

Lotus's Wraight. "It's an environment decision, a full-fledged commitment."

Enough uncertainty surrounds Unix's future, however, to make many people wary of such a commitment. Unix used to come in as many versions as there were vendors, and there is still an ongoing standards battle between Unix International (UI), a group that includes AT&T and Sun, and the Open Software Foundation (OSF), a group sponsored by IBM, Digital Equipment Corp., Hewlett-Packard Co., and others. UI has been pushing a Unix version called System V Release 4, which many companies (including Sun and SCO) are reportedly starting to offer. OSF plans to release its own version, called OSF/1, in November.

To confuse matters even more, each group has developed a different graphical interface for Unix. Sun, AT&T, and other UI members endorse an interface called Open Look, while OSF endorses an interface known as Motif. In addition, Next Inc.'s sleek, Unix-based Next Computer System has a graphical interface of its own. Talks aimed at settling differences between UI and OSF broke off in April, dashing hopes that we'd soon see a truly unified Unix. Still, many developers are encouraged by the progress of the last two years and are pouring more resources into Unix products.

"Life would have been a whole lot easier if the two had gotten together, but things are clearing up anyway," comments Mark Levine, Lotus's senior development manager for Unix products. "We may have two different solutions, but at least we don't have 170 different solutions out there anymore."

No casualties. There are no clear winners and losers in the Unix battles yet—and there may never be—but UI seems to have the momentum on its side with Unix System V, and OSF's Motif interface has been warmly received. But that's not necessarily a prescription for stalemate, according to most Unix watchers. The technical differences tend to be minor, they say, making it easy to pair the Motif interface with System V, for example. And users will be served either way.

The perception of disunity continues to handicap Unix's drive toward the desktop. And the opportunities presented by slow acceptance of OS/2 may be swallowed in part by the increasing popularity of a DOS platform built around *Microsoft Windows.* DOS and *Windows* can't offer the networking solutions that Unix can, but they make a versatile and attractive multitasking environment that's well-suited to personal productivity. To succeed, Unix sellers must counter by bringing the benefits of a more powerful operating system closer to the user.

"What we need to do now is deliver on the promise of Unix," says Ellen Kokos, director of product marketing for the desktop systems and graphics group at Sun's Boston Development Center. "We've got to make its strengths accessible to everyone."

—Christopher O'Malley

CONNECTING DOS AND UNIX

The strengths and weaknesses of DOS and Unix are well known. On the plus side for DOS are 25 million users and a host of commercially available "shrink-wrapped" applications. But DOS is a single-user system, lacking in the increasingly important networking capabilities.

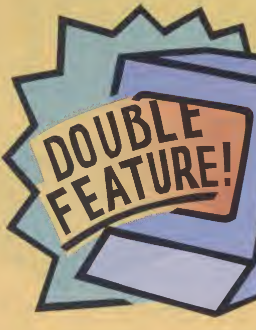
Conversely, Unix is ideal for networking and shared database applications, but it is tough to learn and use, and it lacks applications. Unix's shortcomings are beginning to disappear as developers produce graphical user interfaces and Unix versions of popular applications. In the meantime, however, many companies are finding ways to use Unix in partnership with DOS.

A selection of emulation-software packages, such as *ICE.Ten* ($295) from James River Group in Minneapolis, *PC-Interface* ($450), and *PC Xsight* ($495) from Locus Computing Corp. in Inglewood, Calif., make it fairly simple to create a mixed DOS-Unix environment.

For a Tennessee resort and a Colorado manufacturing plant, this is the best of both worlds. With software that links DOS and Unix machines, these businesses have created computing environments in which the two operating systems coexist in harmony.

At Cumberland Gardens Resort in Crab Orchard, Tenn., *ICE.Ten* lets executives use both DOS and Unix software without being keenly aware of the difference. With a series of "hot keys," users can toggle effortlessly between DOS and Unix applications. An executive might, for example, open a *1-2-3* Release 2.2 file, toggle to the resort's Unix-based reservation package, then hot-key back to *1-2-3*.

Employees at an AT&T manufacturing plant outside Denver appreciate not having to learn a new operating system in order to access an in-house phone directory and other data on the company's Unix-based server. *PC-Interface* combines DOS and Unix files into a single file system that employees can access with DOS commands. "*PC-Interface* lets us keep DOS but add the flexibility of Unix," says Wayne Werbelow, a member of the plant's information-systems staff.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At Dell Computer Corp. in Austin, Tex., salespeople enter orders into DOS-based PCs, but they use *PC-Interface*'s terminal-emulation feature to connect with a Unix-based database that helps configure customers' systems. The sales staff likes having DOS and Unix on one machine, says Tom Lang, Dell's manager of Unix development. And Dell saves money, because the company doesn't need to provide salespeople with Unix workstations.

Saving money was also of concern to Tim Grice, a senior Unix engineer for a MicroAge computer-store franchise. The franchise installed *ICE.Ten* in its four Oklahoma and Missouri stores to tie some 70 employees into its Unix system. A DOS-based network would have required extensive cabling and a network card for each DOS machine. Not only would a DOS network be more expensive, notes Grice, it would also be much slower. "It would creep," he says.

But emulation programs can be slow, too. Emulation technology can slow down an application by a factor of five, says Colin Hunter, chairman of Hunter Systems Software, in Mountain View, Calif. Hunter Systems' *XDOS* software takes a different approach. In order to let a Unix machine act like a PC, *XDOS* actually converts DOS programs into low-level machine code. The result will run on a Unix system just as it does under DOS.

An *XDOS* system consists of an installation/conversion utility ($100 to $375, depending on quantity purchased) and a "key file" created specifically for the DOS program you want to convert. Hunter Systems sells key files for leading DOS spreadsheet, word-processing, desktop-publishing, database, and computer-aided-design packages. Each key file costs roughly 20% more than the stand-alone application. But if you don't want to do your own conversions, the company will port your application for an additional charge.

—H. G. Bissinger

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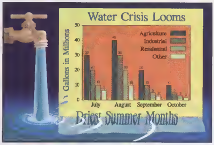

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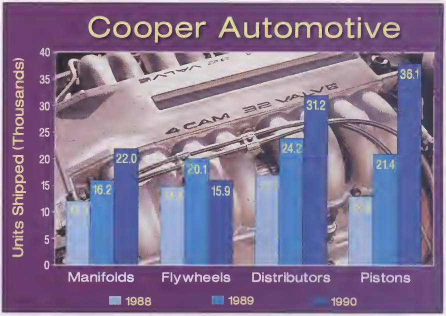

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ANOTHER HARDWARE OPTION: BUILD YOUR OWN

Today's modular components make it relatively easy to produce a private-label clone.

Need a new PC? Why not build your own? It's not as complicated as it sounds. You don't need a degree in electrical engineering. You don't even need a soldering iron. Today, personal-computer technology is so miniaturized, modularized, and unitized that building a PC is really just an assembly process. The heart and soul of the PC—the motherboard—comes as a single unit with all the necessary chips (except memory) and expansion slots. All you do is plug in the memory chips, install any expansion cards, attach the disk drives, and connect the power supply.

The hardest part is getting the motherboard into the case, says Rick Zimmermann, a systems analyst for KMC Stamping in Port Washington, Wis. Zimmermann has built two dozen or so systems for himself, his friends, and his employers. These days, Zimmermann can assemble a PC in about 45 minutes, not including the time it takes to format the hard disk. Building a PC from scratch gives him a "more intimate knowledge of the computer's inner workings," he says.

Zimmermann doesn't do it primarily to save money. The parts for a 20-MHz 80386 system with two floppy-disk drives, a 40-megabyte hard disk, and a color VGA monitor cost $2,223. For an 80286 system with a 20-megabyte hard disk, parts are $1,050. While these prices are well below the cost of a comparable Compaq, IBM, or name-brand compatible, some clones that are not as well known cost the same or perhaps even less. Clones, however, can't offer you the satisfaction of building it yourself, and the manufacturers don't necessarily use the highest quality components.

Zimmermann's employers were skeptical at first. "They were worried about quality," he says, "but I use high-quality components." Zimmermann buys parts from JDR Microdevices, a San Jose, Calif., distributor. He likes JDR's money-back guarantee, its one-year warranty, and its toll-free technical support.

If you happen to live in Silicon Valley, you could visit a Domino Computer Center, where you can buy cut-rate parts and assemble your own system under the tutelage of an on-site technician. The facilities and services are free for those who buy motherboards, and Domino offers a one-year warranty on the parts.

If you aren't sure whether you want to build your own PC, JDR sells low-cost videotapes ($19.95 to $29.95; less with the purchase of a motherboard) that take you through the process, and Aubrey Pilgrim's book series, *Build Your Own and Save a Bundle*, published by Tab Books, includes editions for basic PCs, as well as for '286 and '386 machines.

—Lawrence J. Magid

DO-IT-YOURSELF DATABASES

Can't find what you want at the computer store? Build your own.

Database software is alive with possibilities. But like a lump of clay, it must be molded. The problem is that the sculpting tools—database programming languages—are more than most of us can handle. So we often make too many compromises in an application shaped by others.

However, a new class of "personal programming" tools presents an alternative: Build your own applications without having to learn the cryptic code of programming languages. Rather than requiring you to type line after line of carefully phrased instructions, these tools let you produce a complete application simply by selecting menu options and, in some cases, arranging objects on the screen. You'll need a sound plan and a good head for mapping the flow of information, but you won't need highly technical skills.

Among the leaders in the arena of do-it-yourself applications are *Cause* ($295) from Maxem Corp., *Matrix Layout* 2.0 ($199.95) from Matrix Software Technology, *Clarion Personal Developer* ($199) from Clarion Software Corp., and *Alpha Four* ($549) from Alpha Software Corp. The database engine at the heart of these application generators equips them best for database and closely related applications such as accounting. But some of the products let you integrate other functions, such as text editing, graphics, and telecommunications. *Matrix Layout* and *Cause* are the most adaptable of this group, using built-in features and object extensions to let you expand the scope of your applications.

From objects to outlines. Each program takes a different approach to assembling applications. In *Cause* and *Matrix Layout*, for example, you use predetermined functions to manipulate "objects" that define and link windows, files, and other elements of an application. *Clarion Personal Developer* and *Alpha Four* aren't quite so visual. With *Personal Developer*, you set up the basic data structures (fields, records, and files), then design the appearance and the content of menus, reports, tables, and forms. *Alpha Four* uses a technique it calls application outlining, in which you create customized menus to replace *Alpha Four*'s own menus.

All four programs run on DOS-based personal computers; *Cause* is also available in a Macintosh version. *Cause*-based applications generated on one platform can be recompiled easily to run on the other, and you can share data files across Macs and PCs—a significant advantage in offices that have both.

Much of the driving force behind these and similar products can be traced to *HyperCard*, the hypertext database tool for the Macintosh that was introduced in 1987 and that popularized the concept of nontechnical programming. "*HyperCard* gave people the idea that programming your own applications is possible," says Vincent Garofalo, president of Matrix Software.

Frustrated by the huge gap between easy-to-use file managers and customizable databases, users are now demanding ways to blend the best of both worlds, according to software publishers. "We were being hit over the head with the demand for better application-building tools," says Richard Rabins, president of Alpha Software.

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CIRCLE 106 ON READER SERVICE CARD

own application is to make sure it looks, acts, and creates reports the way you want it to. That was the draw for Donald Buck, a traffic-management supervisor at the Federal Aviation Administration's facility in Hilliard, Fla. "I have no desire to be a programmer," he explains. "I just want to make things faster and easier for the people I work with."

Buck used *Matrix Layout* to develop a traffic-flow application that lets the controllers in his department quickly reroute commercial air traffic when airspace is needed for government use. Buck developed it in about a month's worth of spare time and with no prior programming experience. The application replaces a pencil-and-paper process that used to take controllers 45 minutes or more.

Building an application yourself can also save the time you might otherwise spend searching for the perfect off-the-shelf program. And it can save the hundreds or even thousands of dollars you might pay a consultant or outside developer to create one for you. For example, the San Francisco Newspaper Agency, which handles all noneditorial operations for the *San Francisco Chronicle* and the *San Francisco Examiner*, cut its outside programming costs from $100,000 to less than $25,000 when it began using *Alpha Four* to create applications in-house. One of the applications—a tracking system for the company nurse's office—references information from six databases.

And don't discount the satisfaction and sense of accomplishment that comes with creating your own application. "The reason personal computing really took off in the first place was this ability to do things for yourself, to solve your own problems," explains Rabins.

The *1-2-3* connection. At the Newspaper Agency, many employees are trying their hand at programming small applications for themselves. "*Alpha Four* has opened a lot of new doors for us," observes Sy Guth, manager of microcomputer systems.

With *Alpha Four*'s import/export facility, Newspaper Agency employees can simply transfer their *1-2-3* worksheet data into the applications they create. Other application generators provide varying levels of *1-2-3* support. *Personal Developer* can import *1-2-3* data, for instance, but only as an ASCII file or after *1-2-3*'s Translate utility creates a DIF or *dBase* file. *Matrix Layout* has no built-in facility for importing *1-2-3* data, but its publisher sells a black box extension that lets you access *dBase* files. Reportedly, there is a black box in the works for *1-2-3* files. *Cause* currently imports only ASCII files.

Despite the growing interest among do-it-yourselfers, vendors concede that their biggest customers are still professional programmers and developers. Many programmers find that using personal programming tools to create new applications is easier than writing code. "It's a very fast and easy way to develop a good prototype," explains Charles Meier, director of systems and programming for

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However, because personal programming tools are generally not as powerful as standard relational databases, their initial appeal has dimmed in some instances. Lab Animal Management & Business Systems (LAMBS), for example, an Ephrata, Pa., developer of medical-research applications, switched from *Cause* to *Omnis 5*, a data-management system that also runs on both PCs and Macs. Among the reasons LAMBS decided to switch, President Joe Hardesty cites *Cause*'s lack of multiuser capabilities (which Maxem says it will soon add) and such limitations as the number of entry fields in a file. "The idea is great, and the programming part is pretty easy," he says, "but *Cause* just couldn't do what we needed it to do."

The right stuff. "You're not going to produce *1-2-3* Release 4 with any of these tools," concedes David Thomas, Maxem's president, "but you can produce some things that go beyond basic databases." Then again, not all nonprogrammers have the right temperament even for a do-it-yourself application. You may not have to wrestle with syntax, but you do need logic skills, patience, and a fondness for piecing together puzzles.

These are the same qualities you need to write spreadsheet macros. "If you can create macros in *1-2-3*," agrees Alpha's Rabins, "you can definitely produce an application using *Alpha Four.*" Observes Thomas: "*1-2-3* is a personal programming tool for rows and columns. Lotus doesn't call it that, but that's what it is."

No matter what you produce with one of these programs, you're entitled, in most cases, to sell or distribute it without having to pay a license fee. *Matrix Layout* and *Clarion Personal Developer* grant you an unlimited license, as do higher-priced editions of *Cause* ($495) and *Alpha Four* ($995).

Despite the advantages of doing it yourself, most publishers estimate that fewer than one in five computer users really needs a personal programming tool. "The bottom line is that if you can already do what you want to do with *1-2-3* or *dBase*, there's no point in building another application," says Matrix's Garofalo. "But [an application generator] can be a very important resource to those who need it."

—Christopher O'Malley

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CIRCLE 107 ON READER SERVICE CARD

PC MANUFACTURERS DISCOVER A NEW BREED OF CUSTOM CHIPS

How Okidata produced a laser that's twice as fast as some competitors'

Application-specific integrated circuits (ASICs) are appearing in everything from cars to video games to supercomputers. ASICs can be customized to perform almost any function that requires fast, repetitive processing. And ASICs are "cheaper, smaller, and use less power," says Michael Slater, editor of the leading industry newsletter *Microprocessor Report,* of Palo Alto, Calif.

The recently released OkiLaser 820 laser printer from Okidata includes a custom ASIC capable of increasing performance to two or even three times that of similar laser printers, according to the company. Okidata officials say the ASIC allows the printer to manipulate fonts up to 200 times faster than other laser printers. Indeed, testing done for a *LOTUS* magazine review of the printer shows the OkiLaser generating complex text-only documents almost twice as fast as the Hewlett-Packard HP LaserJet III.

The OkiLaser's printing engine depends upon the BP100A, an advanced ASIC, but Okidata did not design it. The chip was created by BluePoint Technologies, a New Hampshire company recently acquired by Adobe Systems, of Mountain View, Calif. Adobe, the developer of the industry-standard PostScript page-description language for printers, plans to use BluePoint's technology to provide specialized ASICs to its customers, according to Carolyn Bell, the director of engineering for Adobe's International Systems Division.

CUSTOM ASIC APPLICATIONS WILL GROW AT A RAPID PACE.

The BP100A is a high-speed microchip that contains the same essential logic that most printer vendors cast in software or in a bevy of logic chips wired together to perform repetitive font-rotation and font-scaling functions. In essence, the BP100A is a font-manipulation computer that replaces and is faster than conventional font-manipulation techniques.

As ASICs become cheaper to design and manufacture, industry watchers such as Slater expect the number of ASIC applications to grow at a rapid pace. Like PC software, ASIC design depends more

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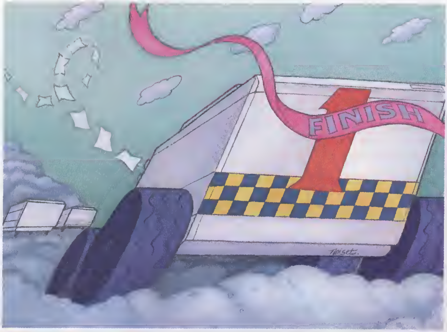

MICHELLE NOISET

on human engineering than on a giant chip-fabrication plant built with vast infusions of capital.

ASICs begin as digital maps of generic logic chips called gate arrays. Depending on the type of gate array being used, these chips contain from 1,000 to 20,000 unlinked logical devices that designers can combine to form a working integrated circuit. The chip design is then sent to a "silicon foundry," a for-hire IC factory, for testing, verification, and finally production in volumes ranging from handfuls to truckloads.

Chris Hassett and Harry Collins, founders of BluePoint, say that they co-designed, developed, and tested the BP100A on a Tandy PC running PC-DOS and computer-aided engineering (CAE) software from Viewlogic Corp. of Marlborough, Mass. Hassett, formerly a circuit designer at Digital Equipment Corp., began work in September 1987 and had a successful chip by April 1988.

COMPARED WITH THE $100 MILLION INTEL SPENT TO DEVELOP THE 80386, AN ASIC IS A BARGAIN.

This story doesn't surprise Ron Maxwell, vice president of research and development for ViewLogic, who says that the rising power of PCs and the falling cost of CAE software allow "more engineers to get these things on their desks and do design." The use of ASICs, he predicts, will explode once circuit engineers become more familiar with CAE platforms. Says Maxwell: "As the tools become more accessible, the markets [for ASICs] will open up."

However, development is not cheap. Hassett says it costs up to one year and $2 million to design an ASIC, but compared to the three years and the $100 million estimated design cost to produce the Intel 80386 microprocessor, an ASIC is a bargain. Once the ASIC has been tested, debugged, retested, and finally completed, the only remaining costs are manufacturing and raw supplies.

Clearly, ASICs have a bright future. Recent examples of ASIC use are found in the Sun Microsystems' SPARCstation 1+, which has seven ASICs. Company spokesman John Loiacono says the ASICs will reduce manufacturing costs "substantially" and will reduce the size of the system motherboard by more than half.

—Garry Ray

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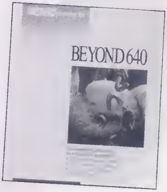

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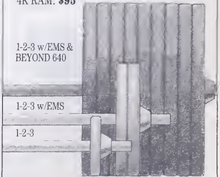

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SIGGRAPH conference planner Andrew Goodrich (left), recently met with Yuri Bayakovski, chief of the Computer Graphics Department, Institute of Applied Mathematics, USSR Academy of Sciences.

It's a Small World

With *glasnost* the order of the day, the United States and the Soviet Union are getting together on more than nuclear disarmament. Now it's computer graphics. First, the Soviets invited representatives of the Association for Computing Machinery's Special Interest Group on Computer Graphics (SIGGRAPH) to appear on *120 Minutes*, a Soviet morning news show. Then SIGGRAPH hosted a small Soviet delegation at its recent conference in Dallas. Now, with the help of funding from SIGGRAPH, Moscow is set to host Graphicon '91, a computer-graphics conference scheduled for the last week of February 1991.

Cultural and technological exchange is lively on the European front, as well. This month, the first European Technology Roundtable Exhibition (ETRE) takes place in Opio, France. The conference is intended to bring American and Asian technology innovators together with European customers and distributors. Europe constitutes the PC industry's fastest-growing market, already accounting for 32%, based on unit shipments, according to Dataquest, a San Jose, Calif., market research firm.

Future ETRE events are scheduled for April and September 1991. *—Jennifer Smith*

Ready, Set, Code

Hackers take note: A new prize is on the horizon. The Loebner Prize, established earlier this year, will be awarded annually for the computer program that acts the most like a person—that is, the program that can carry on a "conversation" in the most convincingly human way. The main requirement is that a program communicate in English via a computer terminal. The subject should be within the realm of ordinary experience. In other words, the weather, fashion, and baseball are okay; meteorology, metaphysics, and monoclonal antibodies are out.

To evaluate the programs, the judges will use a variation of the Turing Test, developed 40 years ago by the late British mathematician Alan M. Turing and thought by many to be the ultimate test of machine intelligence. In the modern variation, the judges will interact with about 10 computer terminals, at least one of which will be controlled by a person. They will try to determine whether the terminals are controlled by a human or by software, qualifying each decision with a confidence rating. The winning program will be the one that does the best job of fooling the judges.

The prize committee, a group of computer scientists, philosophers, and psychologists, will name the first winner of the Loebner Prize Medal in the fall of 1991. An award of $1,500 will come from a fund established by Dr. Hugh G. Loebner, a New York businessman and philanthropist. However, if someone ever creates a program that satisfies every particular of the Turing Test, the entire fund—$100,000 or so—will be awarded and the prize discontinued.

The deadline for submissions is May 31, 1991. For entry requirements and application materials, write to Dr. Robert Epstein, Executive Director, Cambridge Center for Behavioral Studies, 11 Waterhouse St., Cambridge, MA 02138.

—J. S.

Big Science

The National Science Foundation Network (NSFNET) is already the largest public-access research and education network, linking more than 1,800 university, industry, and government research networks. By the end of this year, it aims to be the fastest, as well. NSFNET's new telephone-transmission standard—called T3—will speed data across the network at 45 megabits, or about 5 million characters, per second. That's the equivalent of 1,400 single-spaced, typed pages.

NSFNET is managed and operated out of Ann Arbor, Mich., by the Merit Computer Network, a consortium of eight Michigan universities. Anyone associated with a connected university, company, or government department can access the network. It gives its users coast-to-coast access to mainframe computing centers, national databases, library collections, satellite data, medical imaging equipment, scientific instruments, and other high-tech resources. With T3's blinding speed, researchers will be able to control and monitor such computer-intensive applications as global climate modeling, gene mapping, and other projects that require remote interactive graphics and distributed data processing.

—J. S.

JULIA TALCOTT

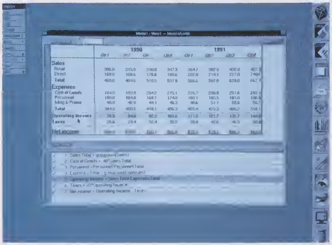
Improv: A New Approach to Spreadsheets

Ever get frustrated by the number/letter matrix of spreadsheets? Remembering the contents of cells B4 and G22 may become a habit for experienced *1-2-3* users, but nobody ever said it was ideal. After almost four years of research, Lotus has developed a new approach to viewing, manipulating, and presenting spreadsheet data.

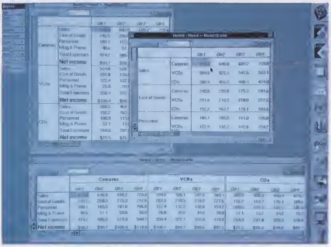
Lotus Improv, known formerly by its code name, *Back Bay*, is a program for the Next Computer System that isn't for everyone, nor is it intended to replace *1-2-3*. *Improv* is aimed at Fortune 1,000 companies in financial services, banking, and insurance and at other industries that use such strategic applications as market research, forecasting, and merger-and-acquisition analysis.

Improv departs from the classic spreadsheet model in several important ways. Each cell in an *Improv* worksheet is known by what it contains. You won't find cell B4, for example, but you will find *Camera Sales*. One advantage of this method is that formulas are descriptive and self-documenting, as shown in the upper illustration. Another departure is that *Improv* stores formulas separately from the worksheet.

Improv's power lies in its flexible approach to constructing a spreadsheet. The building blocks of an *Improv* spreadsheet are items, categories, cells, and formulas. You build a spreadsheet by defining items and formulas that specify relationships between items. Items help name cells, and users can refer to data by name. The result is a worksheet that has logically expressed, flexible, and reusable elements.



Improv's self-documenting formulas are stored separately from the worksheet.



Data can easily be rearranged and reorganized into various views.

The data in the lower screen illustrates these building blocks. The *Divisions* category contains the groups *Cameras*, *VCRs*, *CDs*. The *Line Items* category is divided into the groups *Sales*, *Cost of Goods*, *Marketing and Promotion*, and *Personnel*. Quarters (*Qtr1*, *Qtr2*, *Qtr3*, and *Qtr4*) form the third category. A classic spreadsheet requires eight formulas to total eight columns of quarterly expenses, but because *Improv* uses general formulas, you can write one formula to control how expenses are totaled across any number of quarters.

Like formulas, the formats that govern categories and groups are also external to the worksheet, which allows you to "clone" worksheet elements. For example, you could add an *Audiocassette* division or another four quarters, complete with formulas and formatting, simply by copying an existing item.

To help users get started, *Improv* comes with 10 applications, including real estate investment, market-share analysis, corporate financial analysis, and grants management for higher education. A separate applications guide explains how the models work and how to modify them.

Improv's graphing, charting, and presentation tools also take full advantage of Next's NextStep multitasking graphical user interface. For example, you can attach a voice message to any graph or spreadsheet; an icon of a pair of lips will alert users to the voice message. The program offers a full complement of chart options, including 2-D and 3-D bar graphs, scatter graphs, pie charts, and more. With "hot links" you can tie worksheet data to a graph so that when the data is changed, the associated graph is automatically updated. A special feature lets you change the orientation of a 3-D bar graph so that you can see any data that might otherwise be hidden.

Improv can import and export *1-2-3* files, but the program has no macro-command language. In many cases *Improv* already controls worksheet operations the same way that *1-2-3* macros do. Nonetheless, Lotus says it plans to add a "scripting language" (a new kind of macro language) in a future release, as well as support for a color display.

Improv is currently in beta testing. It will retail for $695, but for a limited introductory period, users who buy or upgrade to Next's newest computer can receive a free copy of *Improv*.

Release 3.1 Ships

Lotus has shipped *1-2-3* Release 3.1, an upgrade of Release 3 that incorporates the *Impress* spreadsheet-publishing technology. The upgrade also includes some new device drivers and performance improvements (see "First Impressions of Release 3.1" in this issue). Network versions of the program will follow in the fourth quarter, as will the Lotus Add-In Toolkit for Release 3.1. Since publication of the July @Lotus column, Lotus has decided not to develop an OS/2 version of the program.

1-2-3 Release 3.1 runs as a full-screen application under *Microsoft Windows* 3.0. It supports Microsoft's new DPMI (DOS protected-mode interface) specification, so you can access the extended memory available in *Windows*, launch the program from a *Windows* icon, and use the *Windows* Clipboard to move data between applications. However, Release 3.1 won't provide the pull-down menus, dialogue boxes, resizable windows, and Dynamic Data Exchange of a true *Windows* application. Lotus has said it is working on a *Windows* version of *1-2-3*.

To run *1-2-3* Release 3.1, you need an IBM, Compaq, or compatible 80286 or 80386 computer, a hard disk, 1 megabyte of available RAM, and DOS 3.0 or higher. The program retails for $595, but if you bought *1-2-3* Release 3 on or after May 7, you may upgrade to Release 3.1 free until December 31. If you bought Release 3 before May 7, the upgrade charge is $35. *1-2-3* Release 2.2 users may upgrade for $75 until December 31. Users of *1-2-3* Release 2.01 and earlier releases may upgrade for $150. For information on upgrading, contact a Lotus-authorized reseller, call Lotus Selects at 800-635-6887, or call 800-TRADEUP.

AlphaWorks to LotusWorks

LotusWorks, the low-end integrated software package that Lotus acquired from Alpha Software Corp. and renamed, is now available through Lotus-authorized resellers (see "Lotus Acquires AlphaWorks" in July's @Lotus column). The program provides spreadsheet, database, graphics, and communications capabilities, as well as a word processor with a spell checker, a thesaurus, and mail-merge functions.

LotusWorks is also packaged with personal computers from Packard-Bell Electronics, IBM, and Olivetti USA. Users of Alpha Software's *AlphaWorks* 1.0 or *Electric Desk* 1.0 may upgrade to *LotusWorks* for $49. For information on *LotusWorks* or to place an order, call Lotus Selects at 800-635-6887; for upgrade information only, call 800-343-5414.

IBM to Bundle Lotus Products with PS/2s

From September 4 through January 15, 1991, *LotusWorks* and *Lotus Magellan* will be bundled with selected PS/2s (models 25 through 65) purchased through IBM's authorized reseller network as part of IBM's "Grand Scale Sale" promotion.

LotusWorks is an all-in-one program that includes a word processor with spell checker and thesaurus, a database manager, a spreadsheet, graphics, and communications capabilities. *LotusWorks* is the only entry-level integrated software package that offers full compatibility with *1-2-3* and Ashton-Tate's *dBase*.

Magellan 2.0 is an award-winning utility program that lets you find, view, and use information on your computer's hard disk. You can search for files containing specific words or phrases and launch into an application with a single keystroke. *Magellan* also contains a full set of DOS utilities for easy file maintenance.

Lotus Development Corp. has also developed an exclusive installation and menu program for the PS/2 promotion. *LotusInstall* guides users through the installation of all six software products included in the package: *Magellan* and *LotusWorks*; *Quicken*, from Intuit; *PFS: First Publisher*, from Software Publishing; *Calendar Creator Plus*, from Power Up! Software Corp; and *PGA Tour Golf*, from PGA Tour Inc.

Purchasers of the PS/2-Lotus bundle will receive 30 days of toll-free telephone support from Lotus. After that, users can purchase Lotus Prompt support service for $49. PS/2 customers will also receive a free, six-month subscription to *LOTUS* magazine.

Agenda 2.0 Ships

In August Lotus shipped the DOS version of *Lotus Agenda* 2.0, the company's personal-information manager. Network editions and an OS/2 version will follow.

Lotus says the new release is easier to learn than the original, and the company will refund your money if you're not up and running with the program in 30 minutes. To help you get going quickly, *Agenda* 2.0 offers redesigned documentation, a tutorial program, and four modifiable "starter" applications for managing activities, accounts, people, and general information.

Agenda 2.0 runs under DOS 2.1 or higher on an IBM PC, PS/2, or compatible computer with a hard disk and at least 640K of RAM. The program is available from authorized resellers for a suggested retail price of $395. The upgrade price is $99, but if you bought *Agenda* 1.0 or 1.01 between May 21 and September 21, you may upgrade for $30. For more information on upgrading, contact an authorized reseller, call Lotus Selects at 800-635-6887, or call 800-TRADEUP.

Viewer Toolkit for Magellan 2.0

The Magellan Viewer Toolkit is now available for *Magellan* 2.0. With the toolkit, developers can create additional viewers for *Magellan*, Lotus's text-search-and-retrieval utility. *Magellan* 2.0 shipped in April with viewers for more than 40 popular software applications. Viewers allow *Magellan* to display the contents of DOS-based files as they appear in their native applications.

The Viewer Toolkit includes documentation on how to design, test, and debug a viewer, plus some sample code. Lotus maintains a list of available viewers and publishes them in the *Lotus Products Enhancement Guide*. The toolkit is available directly from Lotus for $150. Owners of the previous version may upgrade for free. In addition to the toolkit, developers need *Magellan* Release 2.0, DOS 2.1 or higher (DOS 3.0 or higher is recommended), and Watcom C version 7.0. For information, call Lotus at 800-343-5414.

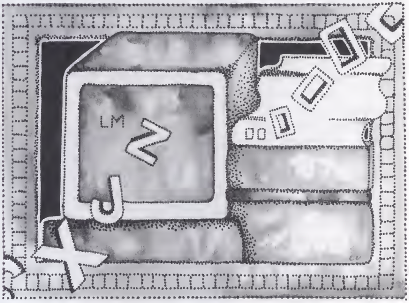
2.2/Quicken Bundle

As part of a special promotion, Lotus is packaging *1-2-3* Release 2.2 with *Quicken* 4.0, a popular small-business and personal-finance program from Intuit, of Palo Alto, Calif. The bundle also includes *@Quicken Link*, a *1-2-3* add-in that provides menu access to *Quicken* data from within *1-2-3*, along with budgeting and forecasting templates. The *1-2-3/Quicken* bundle is available for a limited time through selected Lotus-authorized resellers.

Database Statistics Simplified

The @D functions make short work of statistical calculations.

BY DANIEL GASTEIGER



LISA VIVILECCHIA

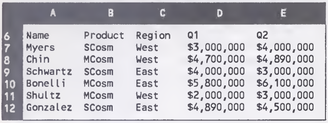
When you store information in a *1-2-3* database, you can easily sort the information, find specific entries, or copy entries from the database. But that's not all you can do. Using the collection of database statistical @functions, or @D functions, you can calculate the sum, average, variance, standard deviation, maximum, minimum, and the total number of database entries.

These functions are similar to some of the standard @functions, such as @SUM, @AVG, and @MIN. The critical difference is that @D functions let you specify the criteria that a record must meet in order to be included in the calculation.

For example, if you're working with a database of employee salaries, you might wish to sum the salaries of all employees in a particular department. Or in a database of sales revenues, you might calculate the average sales for a particular region or the lowest regional sales for a specific product. The @D functions handle these types of calculations.

A SAMPLE DATABASE

The @D functions are easiest to learn when you use them on an actual database. So before continuing, create the sample database shown in the following figure:



	A	B	C	D	E
6	Name	Product	Region	Q1	Q2
7	Myers	SCosm	West	$3,000,000	$4,000,000
8	Chin	MCosm	West	$4,700,000	$4,890,000
9	Schwartz	SCosm	East	$4,000,000	$3,000,000
10	Bonelli	MCosm	East	$5,800,000	$6,100,000
11	Shultz	MCosm	West	$2,000,000	$3,000,000
12	Gonzalez	SCosm	East	$4,890,000	$4,500,000

Set a global column width of 12. Press slash and select Worksheet Global Column-Width, and enter *12*. Then format ranges B4..D4 and D7..E12 for Currency with zero decimal places. Select /Range Format Currency, enter *0*, and specify the range to format. Enter the labels in row 6 and in columns A through C. Then enter the values shown in range D7..E12. Remember to omit the punctuation from your entries. For example, enter *3000000* in cell D7, not $3,000,000.

This database shows the first- and second-quarter sales history of a company that makes two products: a high-speed minicomputer called the SuperCosm and a personal computer called the MicroCosm. To conserve space in the database, the computer names are abbreviated as SCosm and MCosm, respectively.

Each salesperson sells either the SuperCosm or MicroCosm in either the western or eastern sales region. As sales manager, you often examine the sales history to gauge employee performance and to project future revenue.

SUM A CATEGORY

Suppose you want to determine the total revenue generated by sales of the MicroCosm computer in the first quarter of the year. For that, you'll use the @DSUM function.

Every @D function takes three arguments: *Input range, offset,* and *Criterion range* (in *1-2-3* Release 2.2

and Release 3, *Criteria range*). An example is @DSUM(*input,offset,criterion).* Let's look at the Input and Criterion ranges first, since the offset is a little more difficult to explain.

The first argument, *Input range,* refers to the database itself and includes the field names, as well as the data records. In this case, the Input range is A6..E12.

The third argument identifies the Criterion range. What you already know about database Criterion ranges applies here. If you're unfamiliar with Criterion ranges, review the Start Here columns in the September through December 1989 issues.

This range is composed of at least two rows. The first row contains one or more field names from the Input range. It's always good practice to copy the field names from the Input range to the Criterion range. By doing so, you avoid any transcription errors that could cause the @D functions to fail. The second row of a Criterion range contains the criteria that a record must match in order to be included in the @D calculation.

In this example, for a record to be selected, it must contain *MCosm* in the *product* field. Copy cell B6 to cell B1 and enter the label *MCosm* in cell B2. This criterion will select all records pertaining to the MicroCosm computer.

The second argument, the offset, identifies the Input range column containing the data to be used in the function's calculation. The argument represents a field's offset from the leftmost column of the Input range. That sounds a little confusing, but in practice it makes sense.

In the sample Input range, the *name* field is the leftmost column, so its offset is 0. The *product* field is one column from the leftmost column, so its offset is 1. The *region* field is two columns from the leftmost, so its offset is 2; and so on.

You want the @DSUM formula to total the first-quarter revenues for the MicroCosm computer. Therefore, the offset for the formula will be 3, since the Q1 field is three columns from the leftmost column in the Input range.

Now move the cell pointer to cell B4 and enter the formula @DSUM(A6..E12,3,B1..B2). This formula returns $12,500,000, the total first-quarter revenues for sales of MicroCosm.

AVERAGE SALES

Try another @D function. Perhaps you want to know the average first-quarter revenue generated by a salesperson working in the western region. For this, you'll need a new Criterion range.

To begin, copy the label from cell C6 to cell C1. Select /Copy and specify cell C6 as the range to copy from and cell C1 as the range to copy to. Enter the criterion *West* in cell C2.

The Input range for the formula will again be A6..E12. Because the function will average first-quarter sales, the offset is 3. Enter the formula @DAVG(A6..E12,3,C1..C2) in cell C4. The formula reveals that average revenues for first-quarter sales in the western region were $3,233,333. To calculate the second-quarter average for the western region, alter the formula slightly by changing the offset from 3 to 4 and then in any blank cell, enter the formula @DAVG(A6..E12,4,C1..C2). Second-quarter sales averaged $3,963,333.

Now suppose you want to determine the lowest first-quarter sales so that you can compare that value with the average. You don't need the Criterion range. Just enter the formula @DMIN(A6..E12,3,C1..C2) in cell D4. It returns $2,000,000.

FIDDLE WITH @D FUNCTIONS

Any criterion you can devise for a database query operation also works in selecting records for an @D function. As you've just seen, by altering the offset argument, you can change the field that an @D formula uses in its calculation. Alternatively, by changing the criterion in the Criterion range you can select different records for the formula to include.

For example, suppose you want to see the average and minimum first-quarter sales for the eastern sales region. Just replace the criterion in cell C2 with the label *East.* The formulas are updated to reflect this change.

As part of your experiment, try some of the other @D functions. Here's a list of them and the calculations they perform:

@DAVG calculates the average of the values in a particular field.

@DCOUNT calculates the number of entries in a particular field.

@DGET extracts a value or label from a particular field (Release 3 only).

@DMAX returns the largest of the values in a given field.

@DMIN returns the smallest of the values in a given field.

@DQUERY selects specific records from an external database (Release 3 only).

@DSTD calculates the population standard deviation of the values in a particular field.

@DSTDS calculates the sample standard deviation of the values in a particular field (Release 3 only).

@DSUM sums all values in a particular field.

@DVAR calculates the population variance of the values in a particular field.

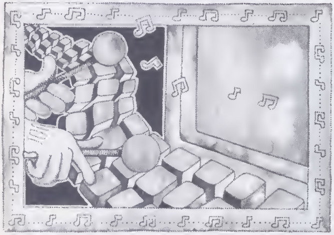
@DVARS calculates the sample variance of the values in a given field (Release 3 only).

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS.*

The Basics of Advanced Macro Commands

Macros can go beyond the capabilities of *1-2-3*'s menus.

BY DANIEL GASTEIGER



LISA VIVILECCHIA

Macros save time. When you store in your worksheet a series of keystrokes as labels and assign them a macro name, you can replay them repeatedly with little effort. *1-2-3* performs automatically almost any spreadsheet task that you can perform manually.

But if you limit a macro's commands to the keystrokes that you can issue, you're also limiting the macro's performance. Advanced Macro Commands let you create macros that are as sophisticated as any computer program. These commands are similar in appearance to the macro-command key words that move the cell pointer, press the function keys, and so on. They differ from the other key words in that they offer features you can't find in the menus and function keys. Despite the term *advanced,* some of them are quite easy to use.

ABOUT ADVANCED MACRO COMMANDS

Advanced Macro Command syntax resembles @function syntax. Each command has a command word, such as GETLABEL, that is analogous to a function name. In most Advanced Macro Commands, the command word is followed by an argument or a list of arguments that identify such details as what cells, ranges, or values the command should manipulate. The command word and its arguments are enclosed within braces.

For example, the Advanced Macro Command that tells *1-2-3*'s macro processor to sound a tone is {BEEP}. This command accepts one argument that can be any value. The value of the argument determines which of three tones the macro processor sounds when it encounters the command in a macro. Your macro may produce different sounds on different computers.

Let's try out the {BEEP} command. Start in a blank worksheet, and enter the labels shown in figure 1.

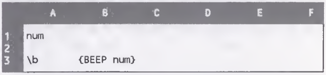
Remember to begin the entry in cell A3 with an apostrophe label prefix ('), or else it will appear in the cell as a series of letter *b*s. Once you've entered the labels, assign those in column A as range names for the adjacent cells in column B. To do this, select /Range Name Labels Right and indicate range A1..A3.

The macro is ready to run. Hold down the MACRO key (Alt on most computers) and press B.

The tone that you hear corresponds to the value 0. Your computer will produce this tone whenever your macros perform a {BEEP} command with an argument that evaluates to 0. Now enter the value 1 in the cell named *num* (cell B1) and run the macro a second time. The resulting tone is different. Incidentally, a {BEEP} command that does not contain an argument produces the tone that corresponds to the value 1.

Before you finish with this simple macro, try running it again with the values 2 and 3 in the cell named *num*. On some computers, an argument of 4 in the {BEEP} command produces the same tone as an argument of 0, an argument of 5 produces the same tone as an argument of 1, and so on.

The {BEEP} command has several useful applications. For example, you can use the {BEEP} command to signal when your macro has finished performing a lengthy procedure. Suppose that *1-2-3* takes several minutes to recalculate your worksheet. You might write a macro that contains the commands {CALC}{BEEP}{BEEP}, then use the macro whenever you update the worksheet. You can leave *1-2-3* to do its work, then return to the computer



	A	B	C	D	E	F
1	num					
2						
3	\b	{BEEP num}				

Figure 1. Try this macro to produce different tones on your computer.

when you hear the tones. As you learn to write more complex macros, you'll find other important uses for the {BEEP} command.

A MENU EQUIVALENT

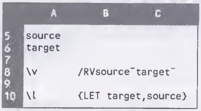
Advanced Macro Commands offer several types of programming tools. Some commands control the order in which *1-2-3* processes other macro commands. Some commands accept input from the keyboard. Still others create disk files and transfer data to and from those files.

Some of the commands are very similar to commands on the *1-2-3* menus. One command, the {LET} command, can sometimes replace such menu commands as Copy or Range Value. {LET} executes much faster than its menu-command equivalents. In simple macros, you may not notice an increase in efficiency. However, you can put the {LET} command to work immediately and begin to learn the Advanced Macro Commands.

The macro command {LET} places a value or string into a cell. Its syntax is {LET *target,source*}. *Target* names a cell into which the command places the information. *Source* names a cell, value, string, or formula. The macro takes the label or value specified by *source* and places it in the cell named by *target*. This command is similar to the Range Value command.

In figure 2 the macro named \v uses the Range Value command to copy information from cell B5 to cell B6. The macro named \l performs the same task. Create both macros by entering the labels shown. Precede the labels in cells A8, A10, and B8 with an apostrophe label prefix. Then use the Range Name Labels Right command to assign all of the labels in column A (range A5..A10) as names for the adjacent cells in column B.

To try the first macro, enter any value in cell B5, then press MACRO-V. The value in cell B5 appears in cell B6. Now use the Range Erase command to remove the entry from cell B6 and press MACRO-L to run the second macro.



```
        A           B                  C
 5   source
 6   target
 7
 8   \v          /RVsource~target~
 9
10   \l          {LET target,source}
```

Figure 2. The advanced {LET} command copies values faster than the Range Values Command.

If you're using *1-2-3* Release 2.*x,* nothing seems to happen! In fact, *1-2-3* copies the entry, but the {LET} Advanced Macro Command doesn't update the worksheet. Press one of the cursor-movement keys, and the value appears

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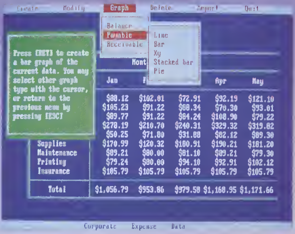

Press [RET] to create a bar graph of the current data. You may select other graph type with the cursor, or return to the previous menu by pressing [ESC]

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in cell B6. Several other keys, including Return, Tab, and CALC, also cause *1-2-3* to display the results of any {LET} commands that your macro issues. In Release 3.x the macro updates the screen immediately.

Because it doesn't update the worksheet and thus change the display, the {LET} command can speed macro processing. Copying several values with successive {LET} commands is faster than copying via menus, which causes the display to refresh with each Copy procedure.

If you want your macro to update the worksheet immediately after an Advanced Macro Command, follow the command with a tilde (~). For example, the macro named *l* will update the worksheet if you edit cell B10 to read {LET *target,source*}~.

The {LET} command offers more than just speed. Unlike the Range Value command, which can do no more than copy the results of formulas from one part of a worksheet to another, the {LET} command can actually manipulate the data as it copies.

For example, the command {LET *target,source**3} multiplies the value of *source* by 3 and places the result in *target*. Likewise, the command {LET *target*, @ROUND(*source*,0)} rounds the value of *source* to zero decimal places and puts the resulting value in *target*.

The {LET} command can perform operations even on a single cell. For example, {LET count,count+1} adds 1 to the value in the cell named *count*.

The {LET} command's main limitation is that it can't copy more than one value at a time. The Range Value command can copy entire ranges of values in a single operation. The {LET} command may manipulate several values in a formula given as the *source* argument, but it can place only one value in a *target* cell.

GO THE NEXT STEP

Advanced Macro Commands, together with macro key words and *1-2-3*'s built-in menu commands, provide a truly powerful programming language. But, as we show in this column, you don't need any programming experience or expertise to use the macro facility.

If you've created only a few simple macros that use just the keystroke sequences, it's time to explore the Advanced Macro Commands and find simple ways to exhance your existing macros. The ones we've looked at here should get you started.

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant and a contributing editor to *LOTUS*.

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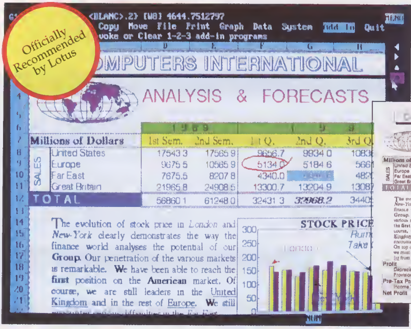

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SALES	United States	17543.3	17565.9	9656.7	9934.0	1083
	Europe	9675.5	10565.9	5134.0	5184.6	566
	Far East	7675.5	8207.8	4340.0		48
	Great Britain	21965.8	24908.5	13300.7	13204.9	1308
TOTAL		56860.1	61248.0	32431.3	32968.2	3440

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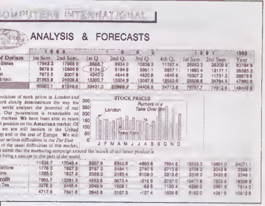

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Slide into @BASE

Automated data transfers extend the power of the familiar FORM window.

BY NICHOLAS DELONAS

Symphony Release 2.2 comes with the *@BASE* add-in program (see "Something Old, New, and Borrowed: *Symphony* 2.2," July, page 52), which means users can create models that manage databases with tens of thousands of records. But if you're accustomed to *Symphony*'s FORM environment, learning the new database procedures in the new BASE environment may be frustrating. Fortunately, you can use *@BASE*'s special @functions and *Symphony* macros to exchange data between *@BASE* and a *Symphony* FORM window.

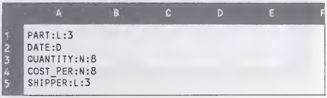
This capability is definitely a big plus for FORM window enthusiasts. For example, if you want to use the FORM environment and need to enter 1,000 records each day, *Symphony* will run out of rows in about a week. But *@BASE* lets you use macros to shuffle data back and forth between the FORM environment and the BASE environment. You get the advantage of disk-based data with *@BASE* and the familiarity of *Symphony*'s FORM window.

REAL-WORLD APPLICATIONS

Imagine you're the shipping and receiving manager at a small wholesale toy distributor. The boss expects an accurate accounting of how much inventory went in and out of stock on any single day and the wholesale price of the merchandise in each shipment. To tackle such a problem, start by setting up a database in the FORM environment. Make sure you're using *Symphony* 2.2 or that you have installed the *@BASE* add-in from Personics Corp. if you're using an earlier release of *Symphony*. Select SERVICES Application Attach and then press the MENU key. You should see BASE.APP, BASEFUNC.APP, and BASEUTL.APP on the screen. If you don't see these files, the macros that follow will not work on your system.

Some computers may not have enough memory to load the *@BASE* add-in. Therefore, before trying the techniques detailed here, make sure your computer has enough memory to run the add-in. To do this, try to load *@BASE*, following the documentation's instructions.

Once you're sure that you can run the *@BASE* add-in, exit *Symphony* by pressing SERVICES and selecting Exit Yes. If you already know that the add-in works on your computer, simply press Escape five times so that you do not attach *@BASE* just yet.



```
     A        B        C        D        E
1  PART:L:3
2  DATE:D
3  QUANTITY:N:8
4  COST_PER:N:8
5  SHIPPER:L:3
```

Figure 1. The Generate command in the FORM environment uses these labels to set up a FORM window database.

Start in the SHEET window of a blank worksheet and enter labels as shown in figure 1. Press the TYPE key (Alt-F10) and select FORM. Select MENU Generate Label 9 MAIN and indicate range A1..A5. *Symphony* creates a FORM window database.

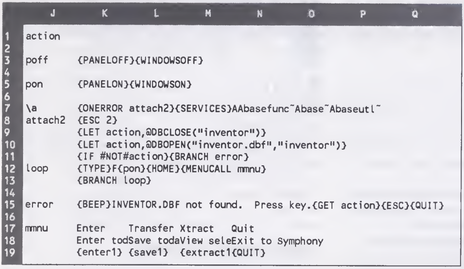
Now press SWITCH (Alt-F9) to return to the SHEET environment. Enter the formula @NOW in cell D15. Since the column is narrow, *Symphony* displays the formula as asterisks. Don't worry about that.

THE TOY BUSINESS

Let's say that your company offers just three items: Man, Cow, and Fish. These three toys are very popular, thanks to the hit TV series "The Man, the Cow, and the Fish," and you are receiving and shipping hundreds of large orders every day.

Stock comes in from three shippers: Blue Truckers Inc., Yellow Shipping Inc., and White Shippers Inc. You ship only through White Shippers. The FORM environment database that you just set up uses the codes MAN, COW, and FSH for inventory and BLU, YEL, and WHI for shippers.

Because of the volume of transactions, you know you'll need to transfer data between *Symphony*'s FORM environment and *@BASE* if you want to use the FORM environment at all. Start by creating a macro that attaches *@BASE* and calls a custom menu. The custom menu must offer these functions: entering records in FORM, transferring records to *@BASE*, and retrieving records from *@BASE*. To this end, enter labels as shown in figure 2. Type *Enter today's records in Symphony (Alt-F10 when finished)* in cell K18, *Save today's records*



```
       J        K        L        M        N        O        P        Q
1   action
2
3   poff     {PANELOFF}{WINDOWSOFF}
4
5   pon      {PANELON}{WINDOWSON}
6
7   \a       {ONERROR attach2}{SERVICES}AAbasefunc~Abase~Abaseutl~
8   attach2  {ESC 2}
9            {LET action,@DBCLOSE("inventor")}
10           {LET action,@DBOPEN("inventor.dbf","inventor")}
11           {IF #NOT#action}{BRANCH error}
12  loop     {TYPE}F{pon}{HOME}{MENUCALL mmnu}
13           {BRANCH loop}
14
15  error    {BEEP}INVENTOR.DBF not found.  Press key.{GET action}{ESC}{QUIT}
16
17  mmnu     Enter    Transfer Xtract   Quit
18           Enter todSave todaView seleExit to Symphony
19           {enter1} {save1}  {extract1{QUIT}
```

Figure 2. This macro attaches the *@BASE* add-in and displays a custom menu.

to DBF file in cell L18, *View selected records from DBF file (Alt-F10 when finished)* in cell M18, and *Exit to Symphony* in cell N18.

Use the Range Name Labels Right command to assign the labels in range J1..J17 as range names for the adjacent cells in column K.

Run the macro by holding down the MACRO key (Alt on most computers) and pressing A. The macro loads the *@BASE* application. If all goes well, the computer beeps and the macro alerts you that the INVENTOR.DBF file wasn't found. Press any key to clear the control panel.

To create the INVENTOR.DBF file that the macro is looking for, select TYPE (Alt-F10) Base, select MENU File Define, and enter *inventor*. Then set up the file definition as follows:

Name	***Type***	***Length***	***Decimals***
PART	Char	3	
DATE	Date	8	
QUANTITY	Numeric	8	0
COST_PER	Numeric	8	2
SHIPPER	Char	3	

After entering the field information, press Escape twice and select Save. Accept the default alias INVENTOR and press Escape again to clear the menu. Press TYPE and select SHEET.

Now you need to create a macro routine that lets you enter records in the FORM environment. The custom menu system needs to call a routine named *enter1*, as indicated in cell K19 in figure 2. Create this routine, as shown in figure 3. Enter all labels and use the Range Name Labels Right command to assign the labels in range J21..J26 as range names for the adjacent cells in column K. Then press MACRO-A to start the macro.

The macro switches to the FORM environment and prompts you with a custom menu. Select Enter from the custom menu. Enter several records, using more than one date. For example, you could enter data as follows:

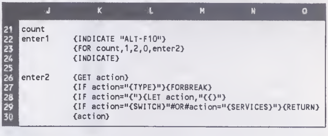
Part	***Date***	***Quantity***	***Cost_per***	***Shipper***
COW	10/12/90	1400	1.75	YEL
MAN	10/12/90	2500	0.50	YEL
FSH	10/12/90	2100	0.35	BLU
FSH	10/18/90	3000	0.23	WHI
MAN	10/18/90	3500	0.47	BLU
COW	10/18/90	4500	1.50	WHI
COW	10/18/90	-1400	1.55	WHI

Press the Insert key to enter each record as you usually do in the FORM environment. After you have entered a few records in the FORM window, press TYPE. The macro will redisplay the custom menu.

Here's how it works:

The routines named *poff* and *pon* simply freeze and reactivate the screen display. These routines are called by the other routines to speed macro processing and eliminate unnecessary screen flickering. The *\a* routine works as follows:

{ONERROR attach2}{SERVICES}AAbasefunc~Abase~Abaseutl~ instructs *Symphony* to run the *attach2* routine in the event of an error. The macro then uses the



```
       J          K          L          M          N          O
21  count
22  enter1     {INDICATE "ALT-F10"}
23             {FOR count,1,2,0,enter2}
24             {INDICATE}
25
26  enter2     {GET action}
27             {IF action="{TYPE}"}{FORBREAK}
28             {IF action="{"}{LET action,"{{}"}
29             {IF action="{SWITCH}"#OR#action="{SERVICES}"}{RETURN}
30             {action}
```

Figure 3. The looping *enter2* routine lets you enter records in the FORM environment. When you press the TYPE key, the routine ends.

Application Attach command to attach BASEFUNC.APP, BASE.APP, and BASEUTL.APP. If these applications are already attached, the ONERROR command traps the error.

{ESC 2} exits the menu system.

{LET action,@DBCLOSE("inventor")} enters one of *@BASE*'s @functions in the cell named *action*. Here, the @DBCLOSE function closes the file, if it is open, with the alias INVENTOR.

{LET action,@DBOPEN("inventor.dbf","inventor")} opens the database file INVENTOR.DBF and assigns it the alias INVENTOR.

{IF #NOT#action}{BRANCH error} determines whether the cell named *action* contains a zero. If it does, the macro branches control to the *error* routine.

{TYPE}F{pon}{HOME}{MENUCALL mmnu} switches to the FORM environment and calls the *pon* routine to reactivate screen updating. The macro then moves the cell pointer to the home position and calls the custom macro labels that begin in the cell named *mmnu*. The custom menu calls either the *enter1* routine, the *save1* routine, the *extract1* routine, or discontinues macro processing, depending on what you select.

{BRANCH loop} branches macro control back to *loop* to redisplay the custom menu.

The *enter1* routine lets you enter records in the FORM environment. Here's how it works:

{INDICATE "ALT-F10"} sets the indicator to read "ALT-F10." This reminds you to press Alt-F10 when you want to return to the menu. Unlike *1-2-3* Release 2.2., *Symphony* Release 2.2 doesn't let you create longer, more descriptive indicator prompts.

{FOR count,1,2,0,enter2} runs the *enter2* routine (see below) until you press Alt-F10. Since the step-number argument is 0, the {FOR} loop runs until the looping subroutine processes a {FORBREAK} command.

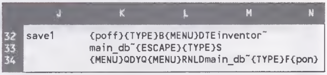
{INDICATE} resets the READY indicator to its default.

The *enter2* routine examines each keystroke, looking for the TYPE key. When you press TYPE, the macro issues a {FORBREAK} command. Here's how it works:

{GET action} stores the macro equivalent of your key press in the cell named *action*.

{IF action="{TYPE}"}{FORBREAK} issues a {FORBREAK} command if *action* contains the label *{TYPE}*, and then macro processing continues in cell K24.

{IF action="{"}{LET action,"{{}"} changes the label in *action* to the {{} command if *action* contains a left brace. Since the macro calls *action* as a macro routine, it must replace left braces with the {{} command, or the macro will crash.



```
32  save1      {poff}{TYPE}B{MENU}DTEinventor~
33             main_db~{ESCAPE}{TYPE}S
34             {MENU}QDYQ{MENU}RNLDmain_db~{TYPE}F{pon}
```

Figure 4. The *save1* routine transfers records from the FORM database to the INVENTOR.DBF file.

{IF action="{SWITCH}"#OR#action="{SERVICES}"}{RETURN} disallows pressing SWITCH or SERVICES by simply looping when these keys are pressed.

{action} passes the captured keystroke to *Symphony*. So, from the user's perspective, *Symphony* is behaving much the way it normally does in FORM mode.

TRANSFERRING RECORDS

Now you need to code a routine for transferring records from the FORM database to the *@BASE* DBF file. Select Quit from the custom menu and switch to the SHEET mode.

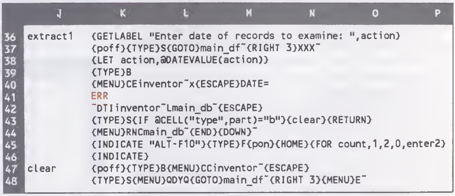
Create the *save1* routine by entering labels, as shown in figure 4. Use the Range Name Labels Right command to assign the label in cell J32 as the range name for cell K32. Press MACRO-A to start the macro. Select Transfer from the custom menu to transfer the records you previously entered from the FORM database to the INVENTOR.DBF file on disk. The macro transfers the records and clears the FORM database.

Here's how it works:

{poff}{TYPE}B{MENU}DTEinventor~ freezes the screen display and switches to the BASE environment. The macro then issues the Date Transfer Export command and enters the file name INVENTOR as the *@BASE* file to export to.

main_db~{ESCAPE}{TYPE}S enters range *main_db* as the range to export records from. The macro clears the control panel and switches to the SHEET environment.

{MENU}QDYQ{MENU}RNLDmain_db~{TYPE}F{pon}



```
36  extract1   {GETLABEL "Enter date of records to examine: ",action}
37             {poff}{TYPE}S{GOTO}main_df~{RIGHT 3}XXX~
38             {LET action,@DATEVALUE(action)}
39             {TYPE}B
40             {MENU}CEinventor~x{ESCAPE}DATE=
41             ERR
42             ~DTIinventor~Lmain_db~{ESCAPE}
43             {TYPE}S{IF @CELL("type",part)="b"}{clear}{RETURN}
44             {MENU}RNCmain_db~{END}{DOWN}~
45             {INDICATE "ALT-F10"}{TYPE}F{pon}{HOME}{FOR count,1,2,0,enter2}
46             {INDICATE}
47  clear      {poff}{TYPE}B{MENU}CCinventor~{ESCAPE}
48             {TYPE}S{MENU}QDYQ{GOTO}main_df~{RIGHT 3}{MENU}E~
```

Figure 5. The *extract1* routine copies records from the INVENTOR.DBF file into the FORM database.

uses the Query Delete command to erase all records in range *main_db*. The macro then uses the Range Name Labels Down command to reassign the range names for the first record in the *Symphony* database because the previous actions reassign those names to the record labels themselves.

Finally, you need to code a routine for transferring records from the INVENTOR.DBF files to the FORM window. Select Quit and switch to the SHEET environment. Enter the labels shown in figure 5. Cell K41, shown in color, contains the following formula, which initially evaluates to ERR:

```
@IF(@MONTH(action)<10,"0","")&
   @STRING(@MONTH(action),0)&"/"&
   @IF(@DAY(action)<10,"0","")&
   @STRING(@DAY(action),0)&"/"&
   @STRING(@YEAR(action),0)
```

Assign the labels in column J as range names for the adjacent cells in column K. Press MACRO-A.

Select Xtract. Enter one of the dates you used when you entered a few sample records. The macro copies all the records for that date into the FORM window. You can then browse through the records by pressing the PageUp or PageDown key. You can also generate a report. If you go beyond the last record, you come to a new record with a default part code of XXX. This reminds you that you're browsing. You cannot enter new records or edit old records here.

Press TYPE to return to the custom menu. Select Quit to halt macro processing.

The *extract1* routine copies records for a particular date from the *@BASE* file into the *Symphony* FORM environment. Here's how:

{GETLABEL "Enter date of records to examine:", action} prompts you for the date of the records you want to look at and stores your response as a label in *action*.

{poff}{TYPE}S{GOTO}main_df~{RIGHT 3}XXX~ freezes the display screen and switches to the SHEET environment. The macro then enters *XXX* as the default string for the *Part* field. This is a reminder not to enter any new records after you have reviewed the old records.

{LET action,@DATEVALUE(action)} replaces the date string in *action* with the equivalent date value.

{TYPE}B switches to the BASE environment.

{MENU}CEinventor~x{ESCAPE}DATE= uses the Criteria Edit command to create a new criterion. The macro enters *DATE=*, and the string formula in cell K41 finishes the criterion with a date string.

~DTIinventor~Lmain_db~{ESCAPE} enters the date criterion and then uses the Data Transfer Import command to copy records from the INVENTOR.DBF file to the *main_db* range. The macro selects Labels to copy fields from INVENTOR.DBF, according to the labels for the fields in range *main_dbf*.

{TYPE}S{IF @CELL("type",part)="b"}{clear}{RETURN} switches to the SHEET environment. The macro then determines if the cell named *part* is blank. If it is, the macro calls the *clear* routine (the last two lines of the *extract1* routine) and loops control back to the *loop* routine.

{MENU}RNCmain_db~{END}{DOWN}~ expands range *main_db* to include the records transferred from the INVENTOR.DBF file.

{INDICATE "ALT-F10"}{TYPE}F{pon}{HOME}{FOR count,1,2,0,enter2} changes the mode indicator, switches to FORM, turns on screen updating, and loops the *enter2* routine (see the description of the *enter1* routine above).

{INDICATE} resets the READY indicator.

{poff}{TYPE}B{MENU}CCinventor~{ESCAPE} freezes the screen display and switches to the BASE environment. The macro then cancels the date criteria and clears the control panel.

{TYPE}S{MENU}QDYQ{GOTO}main_df~{RIGHT 3}{MENU}E~ switches to the SHEET environment and deletes all records in the *Symphony* database. These were the records temporarily copied from the INVENTOR.DBF file for review. The macro then erases the temporary default of XXX for the *Part* field.

CREATING APPLICATIONS FOR *@BASE*

Using macros with the *@BASE* add-in application can make a lot of sense. By setting up a macro-driven interface, you need only sit down with the *@BASE* documentation once to get your model up and running. You can set up the macro to bring in a subset of data and then generate reports in *Symphony*. In this example, data is extracted by date. It's easy to modify this extract to work for a range of dates or some other criterion. Here, for example, you could modify the macro to extract all records for a particular shipper. And once debugged, your macro will allow others to work with the *@BASE* environment, even if they have never used it before.

The Generate command in the FORM environment uses these labels to set up a FORM window database. This macro attaches the *@BASE* add-in and displays a custom menu. The looping *enter1* routine lets you enter records in the FORM environmment. When you press the TYPE key, the routine ends. The *save1* routine transfers records from the FORM database to the INVENTOR.DBF file. The *extract1* routine copies records from the INVENTOR.DBF file into the FORM database. ■

LOTUS The model described in this article is available on disk. See page 16 for details.

TECHNIQUES

LOTUS DOES WINDOWS

Put *1-2-3* and *Symphony* on speaking terms with Microsoft's new DOS operating environment.

BY CHUCK SULLIVAN AND PHYLLIS A. SHARON

Do you want an easy way to manage files and applications? Would you like to run *1-2-3* and a few other programs at the same time? Are you looking for an easy way to exchange data between programs? Does the DOS C> prompt turn you off?

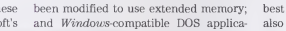
If you answered "yes" to any of these questions, then consider using Microsoft's *Windows* 3.0. This DOS operating environment offers, among other features, a graphical user interface, multitasking, a Clipboard, Dynamic Data Exchange, resizable windows, and enhanced memory management for 80286- and 80386-based PCs—all intended to make managing multiple applications a breeze.

But don't expect all of these features to be available to all applications at all times. *Windows* 3.0 functionality is a matter of degrees. To a large extent, it depends on the type of application you're running: *Windows* or non-*Windows*.

A *Windows* application runs exclusively under the *Windows* environment and in a resizable window. All *Windows* applications use pull-down menus and dialog boxes and follow a set of conventions for the use of the mouse and the keyboard. In short, these applications fully exploit the *Windows* environment. *1-2-3* and *Symphony* are not *Windows* applications, but Lotus Development Corp. is developing a *Windows* version of *1-2-3*.

Non-*Windows* applications fall into three groups: standard DOS applications, like *1-2-3* Releases 2.01/2.2 and all versions of *Symphony*; extended DOS applications, like *1-2-3* Release 3, which have been modified to use extended memory; and *Windows*-compatible DOS applications, like *1-2-3* Release 3.1. (For information on how *1-2-3* Release 3.1 takes advantage of *Windows*, see "First Impressions of Release 3.1," in this issue.)

Another factor that influences *Windows* functionality is the type of PC you use. *Windows* 3.0 has three modes of operation: Real, for 8086- or 8088-based PCs; Standard, for 80286-based PCs; and 386 Enhanced, for 80386- and 80486-based PCs. Each mode offers slightly different memory-management and multitasking capabilities. The more powerful machines can run in lower modes. For example, an 80386-based computer runs best in 386 Enhanced mode, but it can also run in Real or Standard mode. Although it can get fairly technical, understanding the mechanics of *Windows* 3.0 is essential if you want to use the program with non-*Windows* applications.

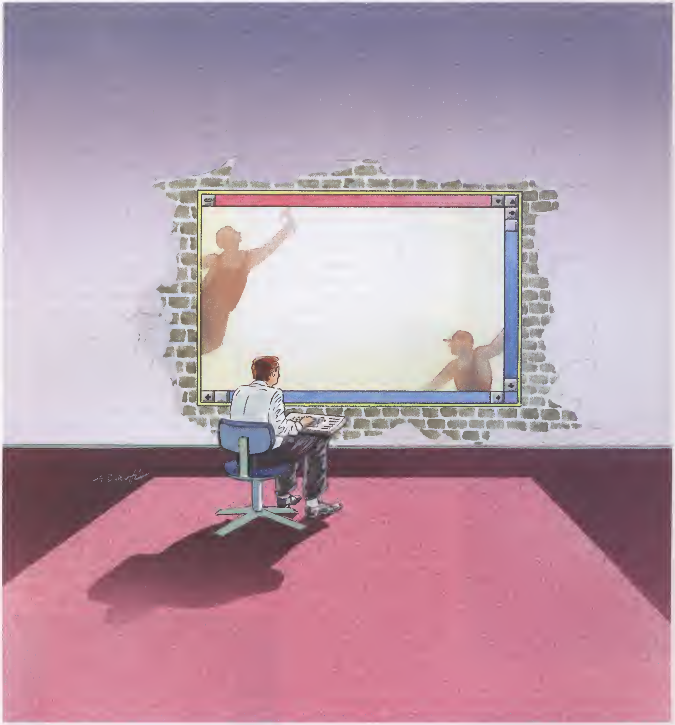


If you're willing to forego *Allways*, you can run *1-2-3* Release 2.2 in a resizable window in 386 Enhanced mode.

Real and Standard Modes

Real mode supports only conventional and expanded memory. This mode is provided primarily for downward compatibility with *Windows* 2.*x* applications and for PCs with up to 640K of conventional memory or with 8088 or 8086 processors. Standard mode, which is for 80286-based PCs, supports conventional and expanded memory and provides access to up to 16 megabytes of extended memory.

In both Real and Standard modes, you can launch and then run several *Windows* applications at the same time, each in its own application window on the desktop. However, though you can simultaneously launch several non-



ANDREA BARUFFI

Windows applications, such as *1-2-3* and *Symphony*, only one non-*Windows* application can be active in memory at a time, and it runs in a full screen; that is, its display takes over the entire *Windows* desktop. In Real and Standard modes, *Windows* uses a process called task switching to move applications into and out of the primary, memory-occupying position.

For example, suppose you've launched *1-2-3* and *Lotus Freelance Plus*. If *1-2-3* is active and you decide to switch to *Freelance*, *Windows* takes a "snapshot" of the current *1-2-3* workspace—that is, the program and data and their location in memory—and stores it in a temporary application swap file. When you switch back to *1-2-3*, *Windows* takes a picture of the *Freelance* workspace, stores it in a temporary file, and resumes the suspended *1-2-3* work session.

Although task switching is preferable to loading and exiting each application, it has several major limitations. First, it's slow, especially if you're working on large models. All that picture taking, storing, and reactivating is time-consuming. Sec-

THIRD-PARTY SOLUTIONS

Hewlett-Packard Co. and Iris Associates offer products that provide distinctive approaches to running *1-2-3* under *Microsoft Windows* 3.0.

An enhancement to *Windows* 3.0, Hewlett-Packard's *NewWave* 3.0 helps applications work together more effectively. Included in this release of *NewWave* is a *1-2-3* "browser," which allows *1-2-3* Release 2.*x* to work within the *NewWave/Windows* environment.

When you run *1-2-3* Release 2.*x* under *NewWave*, you can easily integrate spreadsheet data into other applications, either by copying or via a hotlink. For example, you can include spreadsheets in word-processing documents and E-mail messages.

Suppose you're viewing a word-processing document that contains a spreadsheet. Use the mouse to point to the spreadsheet and double-click the mouse button. This loads *1-2-3*. Now you can go ahead and edit the spreadsheet. For more on *NewWave* 3.0, see the New Products section in the September issue.

Iris's *3-for-3* converts the OS/2 version of *1-2-3* that is part of the Release 3 package into an application that supports such *Windows* features as Dynamic Data Exchange, pull-down menus, and resizable windows. For details, see the review in the July issue. Note that *3-for-3* does not work with *1-2-3* Release 3.1 because that release does not include an OS/2 version.

ond, problems may arise when applications are suspended, especially applications that depend on strict timing or interaction with other applications or devices, such as printers. For example, if a communications application is active when you switch, the application will stop, and the connection may time-out or a file transfer may fail because of a lack of response from the communications application.

In addition, in Real and Standard modes, all non-*Windows* applications run as full-screen applications, as in ordinary DOS. That means that they do not run in a window. Therefore, you cannot resize the window—change its dimensions—or move it to another area of the desktop.

The *Windows* 3.0 Clipboard lets you exchange data, including spreadsheet data and graphs, between applications. For example, you might copy a screenful of data from a *1-2-3* spreadsheet to the Clipboard and then paste it into a *Windows Write* document. Because *1-2-3* and *Symphony* are non-*Windows* applications, you cannot copy a small area of the current screen to the Clipboard, as you can in a *Windows* application. Instead, you must copy the entire screenful of data to the Clipboard, start the other application, then paste the Clipboard contents into that application.

In addition, when working with non-*Windows* applications, you cannot use the Dynamic Data Exchange (DDE) feature. DDE allows you to create hotlinks between *Windows* applications so that if, for example, a value in a spreadsheet table changes, that same value in a linked word-processing document file automatically changes.

386 Enhanced Mode

In 386 Enhanced mode, which is for 80386- and 80486-based systems, you can run multiple concurrent DOS sessions (a feat known as multitasking) and use an area of your hard disk as virtual memory. Virtual memory allows *Windows* 3.0 to use part of the hard disk as RAM, thus increasing the amount of workspace available to applications.

When you start *Windows* 3.0 in 386 Enhanced mode, the program combines available memory—conventional, expanded, and extended—with fixed disk space to determine the total available workspace. You can use a *Windows* 3.0 utility called Swapfile to predefine the fixed disk space that will be used as virtual memory, or you can let *Windows* automatically allocate the space at the start of each *Windows* session. Dedicating a few megabytes of fixed disk space to the Swapfile makes *Windows* run faster and gives you a workspace that remains a constant size, regardless of the number of files you add to or delete from your disk.

When you start an application, *Windows* 3.0 doles out a piece of the total workspace for the application's program code and data. If *Windows* has already allocated all of the available workspace and you try to start another application, *Windows* notifies you that you must first free up some workspace by quitting one or more applications.

In contrast to Real and Standard modes, 386 Enhanced mode can perform true multitasking, which means that processing resources are shared among all active applications via a technique called timeslicing. *Windows* acts like a traffic cop, periodically switching between active applications and ensuring that each gets its share of processing time. Therefore, a spreadsheet keeps calculating and a communications program keeps transferring data, even when they are not the primary active application.

In 386 Enhanced mode, non-*Windows*, graphics-mode applications such as *1-2-3* Releases 2.01/2.2 with *Allways* and *Symphony* with *Allways* must run as full-screen applications. However, text-mode applications such as *1-2-3* Releases 2.01/2.2 without *Allways* and *Symphony* without *Allways* can run in a resizable window. You can also "snap" a non-*Windows* graphical application into a window—that is, temporarily suspend the application but display it in a resizable window. Both capabilities facilitate the exchange of data between DOS applications by letting you highlight an area of the window with the

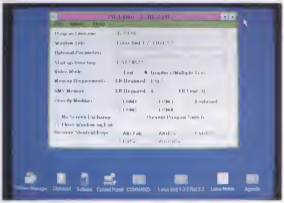


Figure 1. A Program Information File (PIF) helps *Windows* manage the requirements of non-*Window* applications. This one shows the settings for *1-2-3* Release 2.2 in Real and Standard modes.

mouse, copy that data to the *Windows* 3.0 Clipboard, and paste the data into another application.

The PIF File

When running a non-*Windows* application, *Windows* can use a Program Information File (PIF file) to help manage the requirements of the application. A PIF file specifies the application's name and startup directory; requirements for conventional, expanded, and extended memory; background processing limits; and other parameters, such as text- or graphics-mode display, access to COM or LPT ports, and reserved key combinations.

To create a PIF file, use the PIF Editor accessory, which provides a form into which you enter parameters. As figures 1 and 2 show, this form looks different in 386 Enhanced mode than in Real or Standard mode. It's a good idea to give the PIF file and the application's executable file the same name. Since *1-2-3*'s executable file is named 123.EXE, name the PIF file 123.PIF and save it in the same directory as 123.EXE or along the same path. Then *Windows* will use *1-2-3*'s PIF file when you start *1-2-3*.

Figure 1 shows the *Windows* PIF Editor accessory with settings for *1-2-3* Release 2.2 in Real and Standard modes. Let's review these settings:

Program Filename tells *Windows* where the application is and what it is called–in this example, 123.EXE.

Window Title is a description that appears under the program's application icon on the *Windows* desktop when you run and then minimize the application.

Optional Parameters is for including any command-line options used when you start your application–for example, the name of a custom driver set.

Start-up Directory tells *Windows* which disk directory to use as the default when running the application. For all releases of *1-2-3* and *Symphony*, it is best to set the default to the directory containing the program files–for example, C:\123R22.

Video Mode identifies how the application uses the display, that is, whether it's a text-mode or graphics-mode application. If you plan to use *1-2-3* Releases 2.01/2.2/3 with *Allways* or *Symphony* with *Allways*, select the Graphics/Multiple Text option.

Memory Requirements and **XMS Memory** tell *Windows* the application's requirements for conventional and extended (XMS) memory. Leave these at the default values of 128 and 0, respectively.

You need not modify the remaining settings in the Real/Standard PIF file to run *1-2-3* Releases 2.01/2.2/3 or *Symphony* in these modes.

Figure 2 contains a 386 Enhanced mode PIF file for *1-2-3* Releases 2.01/2.2 and *Symphony*. Because its memory management is incompatible with *Windows*' memory management, *1-2-3* Release 3 cannot run in 386 Enhanced mode. PIF settings for 386 Enhanced mode fall into two groups: Basic and Advanced. Among the Basic options, Program Filename, Window Title, Optional Parameters, Start-up Directory, and Memory Requirements operate as described above for Real and Standard modes.

Here's a brief review of the additional options you need to select to run *1-2-3* Releases 2.01/2.2 and *Symphony* in 386 Enhanced mode.

Display Usage tells *Windows* whether to run the application in a full screen or in a window. If you plan to run *1-2-3* Releases 2.01/2.2 with *Allways* or *Symphony* with *Allways*, select Full Screen.

Execution-Background or Exclusive controls how the application cooperates with other applications running concurrently under *Windows*. If you select Background, the application continues to process while you work in another application. If you do not select Background, the active application is suspended when you switch to another application. If you select Exclusive, all other applications are suspended while the application that this PIF file describes is running.

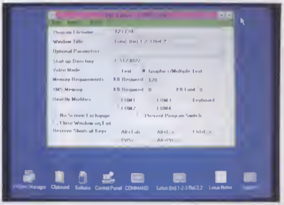
The Advanced options let you fine-tune your system to make the application run better. With these options, you can allocate expanded and extended memory to the application and specify how the application will use other system resources. Be aware that these settings are quite complicated. In fact, modify them only if you're using *1-2-3* Releases 2.01/2.2 or *Symphony* and if you plan to use expanded memory in Enhanced mode.

To allocate expanded memory to an application, enter the amount you need in EMS Memory KB Required and again in KB Limit. This instructs *Windows* to convert some of its memory to expanded memory and assign it to the application. In the PIF file shown in figure 2, 2 megabytes of expanded memory have been allocated to *1-2-3* Release 2.2.

To run *1-2-3* Releases 2.01/2.2 with *Allways* or *Symphony* with *Allways*, select High Graphics under the Video Memory setting. Then under Display Options, select Retain Video Memory.

Memory Reconfiguration

If you use *1-2-3* Releases 2.01/2.2 or any release of *Symphony* with expanded mem-



Program Filename

Window Title

Optional Parameters

Start-up Directory

Video Mode ○ Text ● Graphics/Multiple Text

Memory Requirements KB Required 128

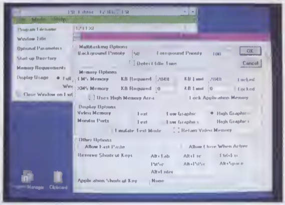
XMS Memory KB Required 0 KB Limit 0

Directly Modifies COM1 COM3 Keyboard COM2 COM4

No Screen Exchange Prevent Program Switch

Close Window on Exit

Reserve Shortcut Keys Alt+Tab Alt+Esc Ctrl+Esc PrtSc Alt+PrtSc



Program Filename

Window Title

Optional Parameters

Start-up Directory

Memory Requirements

Display Usage ● Full Screen ○ Windowed

Close Window on Exit

Multitasking Options

Background Priority 50 Foreground Priority 100

Detect Idle Time

Memory Options

EMS Memory KB Required 2048 KB Limit 2048 Locked

XMS Memory KB Required 0 KB Limit 0 Locked

Uses High Memory Area Lock Application Memory

Display Options

Video Memory Text Low Graphics ● High Graphics

Monitor Ports Text Low Graphics High Graphics

Emulate Text Mode Retain Video Memory

Other Options

Allow Fast Paste Allow Close When Active

Reserve Shortcut Keys Alt+Tab Alt+Esc Ctrl+Esc PrtSc Alt+PrtSc Alt+Space Alt+Enter

Application Shortcut Key None

Figure 2. PIF settings for 386 Enhanced mode fall into two groups: Basic, shown above, and Advanced, shown below. Those shown are for *1-2-3* Release 2.2.

ory, you'll need to reconfigure your computer's expanded memory as extended memory before using *Windows*. How you choose to reconfigure the memory depends on the mode in which you plan to run *Windows*.

If you use *1-2-3* Releases 2.01/2.2 or *Symphony* on an 80286-based PC or if you plan to run *Windows* in Standard mode, you'll need to reconfigure at least 256K of your expanded memory as extended memory. Because many memory boards can be configured for either expanded or extended memory, you can accomplish this task by running the setup program that came with your memory board. The more memory you dedicate to extended memory, the better *Windows* will run. Therefore, you should configure as expanded memory the minimum that the application needs. For example, if your biggest *1-2-3* Release 2.2 worksheet occupies 1 megabyte of RAM, configure only 1 megabyte of memory as expanded memory.

If you use *1-2-3* Releases 2.01/2.2 or *Symphony* on an 80386-based PC, you'll need to make a different adjustment to memory. Many 80386-based expanded-memory managers are incompatible with *Windows* 3.0 Standard and Enhanced modes. Unless you remove the memory manager, *Windows* 3.0 will run only in Real mode. You can run *1-2-3* Releases 2.01/2.2 or *Symphony* entirely under *Windows* and never run them under native DOS—that is, from a C> prompt—because 386 Enhanced mode will emulate expanded memory. Therefore, you can uninstall your old expanded-memory manager and access expanded memory through *Windows*.

To run *Windows* in Standard mode and retain expanded-memory support, you need to use Microsoft's EMM386 expanded-memory utility to reinstall the memory. This utility, which comes with *Windows* 3.0, is designed to replace your current expanded-memory manager. See the *Windows* 3.0 *User's Guide* for details on removing your current memory manager and installing EMM386.

In Summary

When used with *1-2-3* or *Symphony*, *Windows* 3.0 fortifies the operating system. It improves on DOS memory management and lets you use *1-2-3* or *Symphony* simultaneously with other applications.

But all that functionality has a price. At a minimum, you'll probably want to purchase more memory. If you work with large spreadsheets on an 80286 machine, 2 megabytes to 3 megabytes is sufficient, but on an 80386 machine, you'll want at least 4 megabytes. *Windows* 3.0 requires at least 6 megabytes of disk space, and that's not counting disk space allocated to temporary application or permanent swap files. Therefore, you may need either a program that compacts the files on your hard disk or a larger hard disk. And don't forget to get a mouse. It really makes moving around menus and managing *Windows* a snap. ■

Chuck Sullivan is a marketing manager at Lotus Development Corp. Phyllis A. Sharon is associate techniques editor for *LOTUS*.

THE PROGRAM MANAGER: AN OVERVIEW

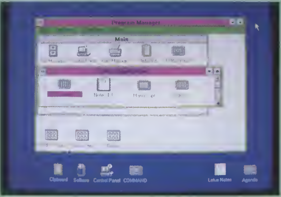
The user's main view of *Windows* 3.0, as shown in the figure, is the desktop and the Program Manager application, which replaces the MS-DOS Executive found in earlier releases of *Windows*. When *Windows* 3.0 starts up, the default light-gray background replaces the C> prompt, and the Program Manager application appears in a window.

The Program Manager lets you organize, launch, switch between, and manage multiple applications. It lets you arrange your applications, each represented as a program item icon, into collections called program groups. By default, *Windows* 3.0 has three program groups: the Main group, the Accessory group, and the Games group. The Main group contains utility programs such as the File Manager, which can be used in lieu of DOS commands. These programs take the drudgery out of common housekeeping tasks like listing the files in a directory; copying, renaming, and deleting files; and copying and formatting disks. The Accessory group contains a variety of programs, including a text editor, a calculator, a calendar, a notepad, a cardfile, and a clock. The Games group contains the Solitaire and Reversi games.

To create program groups and program items on your system, you have two choices. You can let *Windows* automatically search your hard disk for applications and assign them to one of two default groups: *Windows* Applications group or Non-*Windows* Applications group. Be aware, however, that this process is time-consuming, since *Windows* has to search the hard disk for programs. The automatic option is selected during initial installation of *Windows* 3.0. After installation, you can access it via the *Windows* Setup utility.

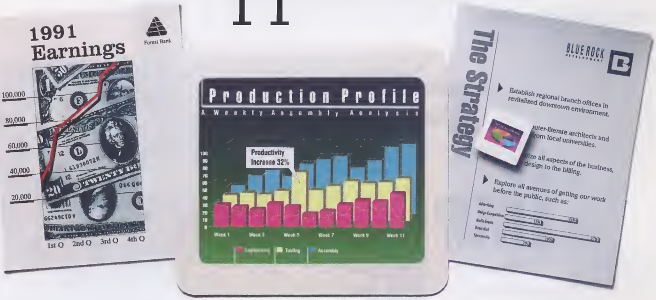
The second method is to use the File New command on the main Program Manager menu to create your own customized program groups and assign program items to them. This option is quicker than the automatic option, and it allows you to control the layout of groups and items on the desktop.

To launch an application, you doubleclick the program group and then doubleclick the program item. *Windows* 3.0 loads the application into memory and makes it active. You can launch an application using the keyboard and the Program Manager menus, but it is more difficult.



Using the Program Manager, you can create customized program groups. On this desktop appears a program group of Lotus applications.

Applause.



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TECHNIQUES

FIRST IMPRESSIONS OF RELEASE 3.1

Although *1-2-3* Release 3 offers great features, such as the ability to create 3-D worksheets and access external databases, its lack of spreadsheet-publishing capabilities makes Release 2.2 with *Allways* awfully attractive. But Lotus Development Corp.'s most recent upgrade may finally solve the dilemma of choosing between the two. *1-2-3* Release 3.1 includes all of Release 3's bells and whistles, along with *WYSIWYG*, an add-in that offers a rich set of sophisticated spreadsheet-publishing features via a what-you-see-is-what-you-get user interface.

Without the *WYSIWYG* add-in, *1-2-3* Release 3.1 looks and feels just like *1-2-3* Release 3, albeit with a few improvements. Notably, Release 3.1 is compatible with *Microsoft Windows* 3.0. It runs in *Windows* 386 Enhanced mode–a feat its predecessor could not perform. In addition, Release 3.1 offers virtual-memory management, which allows you to use a portion of your hard disk as though it were RAM. Other minor improvements include faster @D function recalculation, faster Data External commands, and an additional macro command.

1-2-3 Goes Graphical

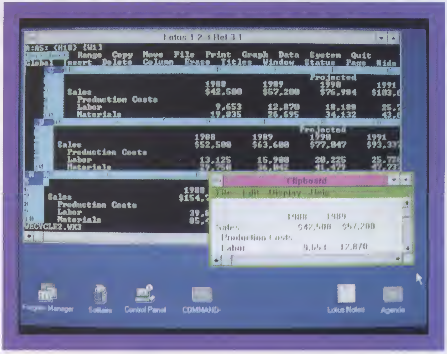
WYSIWYG is certainly the most worthwhile of Release 3.1's advances. You load it via the add-in menu, which you access by selecting Alt-F10. Because it's so useful and takes up only about 200K, you may choose to have the *WYSIWYG* add-in load automatically each time you start a *1-2-3* session.

WYSIWYG enhances the appearance of the *1-2-3* spreadsheet. Seven icons appear on the right side of the display. Four move the cell pointer up, down, left, or right. Another–the question mark–calls up context-sensitive help. Two let you hop between worksheets. Of the lot, these two are the most useful. In fact, they'll be the envy of *1-2-3/G* users because they offer shortcuts for awkward Control PageUp or PageDown key combinations.

WYSIWYG mode lets you edit cells, enter formulas, and use *1-2-3*'s menus–all without leaving the spreadsheet-publishing mode. That means you don't need to switch back and forth between the worksheet and spreadsheet-publishing mode, as you do in *Allways*. To display the menu, move the mouse pointer above the top border of the worksheet. If the *WYSIWYG* menu appears and you want the *1-2-3* Release 3.1 menu, press the right mouse button. Then you're free to use the left mouse button to make menu selections. If you're not using a mouse, type a colon to access the *WYSIWYG* menu, or type a slash to access the *1-2-3* menu. Then make menu selections as you normally would.

Other graphical features include the ability to resize column widths or row heights by using the mouse to move the vertical or horizontal bars in the worksheet borders. To preselect a range using the mouse, press the F4 key and use the mouse to highlight the range. Then make a menu selection–for example, Copy, Move, or Data Fill–that will affect the range. Alternatively, you can preselect a range by holding down the Control key while you drag the mouse.

People experienced in using a graphical user interface (GUI) should note that some Release 3.1 mouse techniques are based not on standard GUI conventions, but rather on *1-2-3* conventions. For ex-



```
                                        Projected
                      1988      1989      1990      1991
Sales               $42,500   $57,200   $76,984   $103,0
  Production Costs
   Labor              9,653    12,870    18,188    25,7
   Materials         19,835    26,695    34,132    43,0

                                        Projected
                      1988      1989      1990      1991
Sales               $52,500   $63,600   $77,847   $93,33
  Production Costs
   Labor             13,125    15,988    20,225    25,71
```

```
                   1988      1989
Sales            $42,500   $57,200
 Production Costs
 Labor             9,653    12,870
```

Spreadsheet publishing, virtual-memory management, and *Windows* compatibility add muscle to Release 3.

BY NICHOLAS DELONAS

ample, in a standard GUI product, such as *1-2-3/G* under OS/2 Presentation Manager, you select a range via a single click-and-drag mouse operation. In Release 3.1, you can specify a range with a similar click-and-drag approach, but then you must click the mouse again to acknowledge the selection—just as you would by pressing the Return key if you had entered the range from the keyboard.

What You See...

Although the functionality of *WYSIWYG* is based on PC Publishing Inc.'s *Impress*, the menu structure is based on *Allways*. This ensures a smooth transition for users upgrading from *1-2-3* Release 2.2, which has *Allways* bundled with it. In addition, menu compatibility allows macros that use *Allways* features to work in *1-2-3* Release 3.1.

WYSIWYG reads and writes *Allways* (ALL) files. Most *Allways* formatting translates seamlessly into *WYSIWYG*, but there are a couple of exceptions. Fonts supported by *Allways* and not by *WYSIWYG* are translated to the closest equivalent font. Also, because *WYSIWYG*, unlike *Allways*, does not support a row height of zero, such rows are converted to a height of one point. In addition to reading *Allways* files, *WYSIWYG* reads CGM Metafiles and *1-2-3* and *Symphony* PIC files.

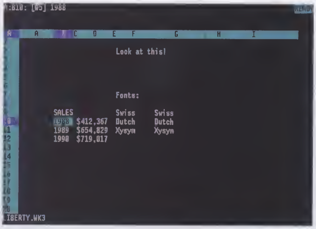
Fonts, colors, lines, borders, and graphs print out just as they appear on the screen. The spreadsheet-publishing features allow you to spruce up presentations. You can highlight important data, combine text and graphics on one page, and annotate a graph—all without leaving *1-2-3*.

WYSIWYG offers four default fonts—Courier, Symbol, Swiss, and Dutch—and supports other fonts available from Bitstream (Cambridge, Mass.). *WYSIWYG* can keep eight fonts in memory at one time. Using the Format Font menu, you can replace any font with any other available font and specify a point size from 3 to 72 points. In addition, you can apply any combination of bold, italic, and underline attributes. If you wish, you can save a collection of fonts in a font library to use later.

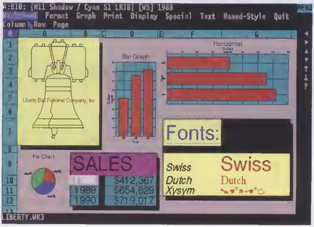
Font selection is easy. Each font is assigned a number from 1 to 8. To help you keep track of which font is assigned to which number, a box listing the fonts appears. Because the box resembles the dialog boxes found in other graphical products, you'll be tempted to try selecting a font by clicking its description in the box. You must, however, choose a number from the menu. Although the list is handy, it would be even better if the descriptions included a sample of the particular font, as in some other graphical products, such as *1-2-3/G*.

After designing a particular font, you can save it as a named style. For example, for all worksheet titles, you might create a named style that consists of yellow text that is in a bold 24-point Dutch font on a red background. You could assign this style the name *title* and the description "Use this style for all spreadsheet titles." The description appears as a long prompt when you highlight that named style on the menu. To apply the named style to a range, you would select Named-Style from the *WYSIWYG* menu and specify the style named *title*.

The *WYSIWYG* Text command brings



```
:B10: [W5] 1988                                   READ

          A        C    D    E    F          G          H          I

                              Look at this!



                              Fonts:

          SALES               Swiss        Swiss
          1988  $412,367      Dutch        Dutch
          1989  $654,829      Xysym        Xysym
          1990  $719,017

IBERTY.WK3
```



```
:B10: {H11 Shadow / Cyan S1 LRTB} [W5] 1988
```

■ **Using *WYSIWYG*,** you can dress up a worksheet with graphs, graphics, formatting, fonts, shadow boxes, and color. The upper figure shows some unadorned data. The lower figure illustrates the post-*WYSIWYG* transformation.

rudimentary word-processing features to *1-2-3*. Using this command, you specify a worksheet range that you can then use as a word-processing window. You can move the cursor in the range and even change the font, color, and attribute of the text, which automatically wraps at the end of each line. This command is particularly handy for annotating a graph.

To enhance the graph, you can add text, arrows, rectangles, polygons, circles, ellipses, symbols, and straight or freehand lines. In addition, you can move, rotate, reshape, and resize a graphic. To assign a color to a graphic element, you can select from a palette of 224 colors.

When it's time to print, you can have *WYSIWYG* scale the Print range. This feature saves you the annoyance of trial-and-error printing. Once you specify a range, *WYSIWYG* scales the fonts and graphics to make the printout fit on one sheet of paper. However, unlike *Impress*, *WYSIWYG* can't print text sideways on a dot-matrix printer.

In *WYSIWYG* mode, you can enhance three-dimensional ranges within a file. If you enable Group mode, however, changes made to one worksheet automatically affect the other worksheets. You can also work with multiple files in memory.

Windows Compatibility

1-2-3 Release 3.1 is a *Microsoft Windows*–compatible DOS application and comes with its own Program Information File (PIF). This file takes the pain out of specifying the system requirements necessary to get the program to run under *Windows*. This upgrade does not, however, represent Lotus's ultimate solution for *Windows*. A *Windows* version of *1-2-3* is currently under development.

Despite its extensive graphical features, Release 3.1 is not a true *Windows* application. *WYSIWYG* doesn't have the *Windows* look and feel, so don't look for cascade menus, Dynamic Data Exchange, or "hot links." You can run *1-2-3* Release 3.1 in a resizeable window, but only if you forego *WYSIWYG* and switch to a text-based driver. *1-2-3* Release 3.1 supports the DOS Protected Mode Interface (DPMI) memory specification and can therefore access extended memory through *Windows* 386 Enhanced mode. That means that when you're running Release 3.1 with *Windows*, *1-2-3* relinquishes virtual-memory management in favor of DPMI as a means of accessing additional memory. If you're using *Windows* in Standard or Real mode, Release 3.1 supports a new version of the Virtual Control Program Interface (VCPI) memory specification used in Release 3 and uses its own swap file.

Improvements Over Release 3

Aside from *WYSIWYG* and *Windows* compatibility, Release 3.1 has several other improvements.

Release 3.1 offers virtual-memory management, which makes a portion of your hard disk function as if it were RAM. This enables you to build larger worksheets without increasing your system's actual memory. But be aware that use of virtual memory can slow performance.

1-2-3 Release 3.1 includes one new macro command, {FORMBREAK}. This command provides a much-needed way to end a {FORM} command from within a macro.

There's also some good news for add-in developers. A new Lotus Add-In Toolkit for Release 3.1 will ship 90 to 120 days after Release 3.1 ships. The new product will support compiled C routines and will include an event manager. Server and node editions of *1-2-3* Release 3.1 will ship in 90 to 120 days, as well.

Finally, Release 3.1 includes all the enhancements that were introduced in the *1-2-3* Release 3 Replacement Disk Kit. These features include faster performance in @D formula recalculation and in the Data External commands.

Program Requirements

Release 3.1 is for 80286- and 80386-based PCs with at least 1 megabyte of system memory and DOS 3.0 or higher, and it is compatible with files from all releases of *1-2-3* and *Symphony*. ■

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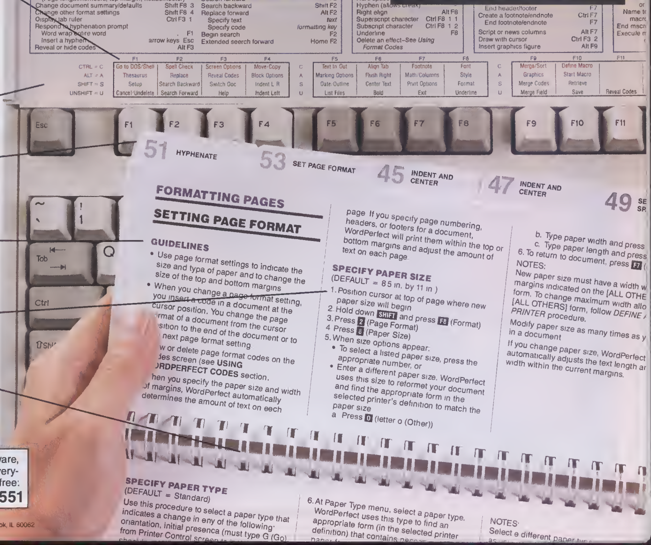

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APPLICATIONS

Nothing Runs Like 1-2-3

John Deere built a heavy-duty information system powered by *1-2-3* Release 3.

BY RICHARD CRANFORD

Estimating how much computer hardware and software will be on-line at the end of the fiscal year can be a difficult task at any company. It's especially difficult at Fortune 500 companies, where double-digit technology-growth rates and MIS budgets of $100 million or more are typical. As managers gain computer savvy and information processing becomes decentralized, it can take a lot of computer power just to keep track of all the computer power.

Nothing, the ad says, runs like a Deere. The ad refers to the farm equipment–from spaceship-size combines to lawn mowers–manufactured by Deere & Company in Moline Ill. But the $7.2 billion firm applies that slogan to its corporate machine, as well.

MIS managers at Deere know that that isn't always easy to do. For example, they used to spend 21 weeks a year estimating future hardware and software needs, planning enhancements to Deere's $89 million investment in computer equipment, and consolidating the data on a mainframe into a master report. So the staff set an ambitious goal: to cut the status-report turnaround time in half. Now, in just 11 weeks, a set of advanced *1-2-3* Release 3 templates produces a more robust and flexible report. The new system lets the company create more-timely and more-accurate MIS budgets, and it helps the computer managers throughout the operations department stay on top of Deere's ever changing technology needs.

Installation-services coordinator Deb Bomberry and programmer Connie Koehn developed a system made up of 20 or so worksheets that are integrated into a status report of Deere's computer equipment and software, including planned purchases. Koehn is one of a dozen people connected on a token-ring local area network (LAN) who use the system to track spending on seven IBM 3090-class mainframes, hundreds of disk and tape drives, printers and other peripherals, and more than 100 PCs.

The Bomberry/Koehn templates, developed early this year, represent state-of-the-art spreadsheet technology. The system requires access to expanded/extended memory, three-dimensional worksheets, and advanced file linking. With this software in a networked environment, Deere officials are able to track spending without struggling with incomplete or outdated information, multiple forms and formats, and incompatible reports. "We can gather data in one place and end up with all the information we need to handle four or five different accounting-related tasks," Koehn explains.

The first attempt to collect computer inventory data in *1-2-3* worksheets began early last year when Bomberry and Koehn created a data-entry system in Release 2.01. Each MIS manager had to retrieve as many as five worksheet files in order to enter information identifying existing equipment scheduled to be decommissioned and new equipment and software scheduled to be added by year's end. They also indicated which warranties were expiring and needed to be replaced with

PHOTOGRAPHY BY BOB BOYD/BOYD-FITZGERALD

At Deere & Company, developers Connie Koehn and Deb Bomberry use *1-2-3* to drive the tractor maker's huge computer investment service contracts. Bomberry and Koehn collected the updated worksheets via the LAN. But daunted by the mechanics of *1-2-3*'s File Combine commands, they manually reentered the managers' reports into a master file. The consolidated reports took a couple of weeks to assemble, wasting people's time and providing outdated information.

The advent of Release 3 made it possible to include several questionnaires in one file and to consolidate results from the questionnaires simply by retrieving a master file and selecting /File Admin Link-Refresh. Koehn's background in operations, including exposure to mainframe programming languages and proper MIS procedures, was crucial to developing a successful system to handle so much information.

The Groundwork

Koehn began setting up the individual worksheets for the various managers by creating a file-building worksheet. It uses macro-driven prompts that guide her through the task of customizing each template for its user. This ensures that the templates match each other in certain ways that are necessary for the consolidation process to work correctly. For one thing, all range names conform to a set of naming conventions she devised. Each template contains about 900 range names (most of them assigned to single cells), which Koehn uses the way she would use variables in a traditional programming language.

The templates are also different from each other, especially in the data they contain. Each one contains a table of the currently installed hardware that falls under its user's jurisdiction. The file-building worksheet assists in the process of loading the tables, which come from an inventory database on one of the IBM mainframes. Koehn downloads the data as delimited ASCII files to her computer's hard disk, moves it into the template files with the File Import command, and converts it to cell entries with the Data Parse command.

Koehn also created a variables file containing certain values, such as depreciation and inflation rates, that are common to all the templates. The templates read these values using file-linking formulas. Keeping these values in a separate file eliminates redundancy, which helps to control the size of the template files and makes it easier to change any assumptions that underlie the whole project.

> DEERE CREATES CONSOLIDATION WORKSHEETS IN MINUTES, NOT WEEKS, BY SELECTING /FILE ADMIN LINK-REFRESH

Koehn documents her work copiously so that her system doesn't grow into an uncontrollable monster as it gains size and complexity. The documentation includes such things as listings of the range names in the template files and diagrams showing which files are linked. On the surface, documenting a system like this seems unremarkable. But not all designers of spreadsheet-based systems treat documentation as an important step in the design process.

Programmer Connie Koehn used her background working with mainframes to create consistent, well-documented *1-2-3* templates.

The Players

Part of Bomberry and Koehn's strategy was to pick participants for the information-gathering process who are at the third level on the organization chart. These managers are close enough to the parties requesting new services to know what's needed in the near future. But they also have the technical expertise to know what equipment will best meet their internal customers' needs. "Part of the division manager's responsibility is not only to understand the user's requirements but also to use the technical expertise they have and put the two together," Bomberry notes.

One manager who participated in the information-gathering process is Al Reagan, manager of Network Software. Koehn created a hardware template for Reagan, which he retrieved via the LAN. The template is 13-sheets deep. The first sheet is simply a table of contents for the rest of the file, along with a few words describing how to navigate around the template. Of the remaining 12 sheets, only 4 require Reagan to enter any data. These are the sheets containing tables of currently installed hardware, equipment to be installed in the remainder of the fiscal year, equipment to be installed in the next fiscal year, and charge allocations. The remaining 8 sheets contain tables of information, formulas, or macros.

Once Reagan completes the task of updating the template, he saves it so that its contents are available, via the LAN, to Koehn's consolidation worksheets. Meanwhile, other managers have been going through a similar exercise for their own areas. The consolidation worksheets are full of file-linking formulas that sum the values from all the hardware or software worksheets.

Data Moves in Many Directions

For Reagan and the other managers, entering data in the hardware and software templates isn't just a chore they must do at the request of a department that needs consolidated information. Every template is also designed to provide its user with an annualized breakdown of hardware or software under his or her control. That is, sheets G through J summarize both the data included in the template and the data the user entered to produce several tables. These tables detail expense-budget amounts, annual-proposal amounts, leasing and maintenance costs, and capital-budget amounts. This helps a manager track spending against his or her division's budget or even create customized reports from the data in the templates. Koehn made customization easy by using a consistent range-naming scheme and by sharing its format with the managers. Thus, each file is at once a part of a large set of data used to create the master report and a self-contained source of data for its user.

EACH FILE IS BOTH A PART OF THE CONSOLIDATED MASTER REPORT AND A SOURCE OF DATA FOR ITS USER.

The Final Steps

To complete the consolidation process, Koehn created one consolidation worksheet as a sample. She then explained to Bomberry and several other staffers how to create additional consolidation worksheets. Although Koehn interviewed people at the beginning of the process to learn what information they would eventually need, it was up to the individual to create his or her own consolidated reports. For this phase of the project, each user assumed the role of programmer and created exactly the report he or she needed. Again, this process was made easier by Koehn's consistent, well-documented range-naming scheme.

Koehn, Bomberry, and others used the *Allways* add-in to produce attractive reports and send them, via the LAN, to the LaserJet printer. Some of the data in the consolidation worksheets were used to create senior management presentations.

Because of the audience, output quality was important. "We achieved great quality with minimal effort," says Bomberry. Since *Allways* enhances live worksheet files, last-minute changes were no problem. "Five minutes before our presentation on the annualized costs, we were still changing some of the inputs," she adds.

The problem with using *Allways* is that Release 3 worksheets must be translated into Release 2.01 worksheets to work with *Allways*. Release 3.1, due out in the third quarter of 1990, will include an add-in, *WYSIWYG*, that uses the technology of the *Impress* add-in, currently available for the Release 2 family. Koehn says it will enable her to enhance output, without making translations to Release 2.01. But unlike *Allways*, *Impress* (and its offspring *WYSIWYG*) can use all normal *1-2-3* functions while it is active. This means that Koehn can devise templates in which the cells and ranges designated for user input are highlighted with color or outlined.

Installation-services coordinator Deb Bomberry emphasizes the importance of presenting senior management with attractive reports.

Some Drawbacks

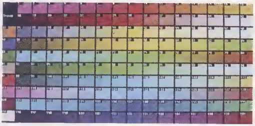
Unfortunately, Koehn's familiarity with mainframe programming languages may have caused some frustration with the limitations of Release 3.

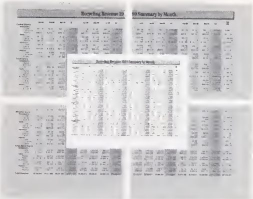
First of all, some of the templates she created were large enough to tax the 3 megabytes of memory in her own computer. While creating Al Reagan's template, for example, her PC ran out of memory as she tried to customize the template with data from the mainframe. In order to continue with her work while waiting for a souped-up RAM board, she conserved memory by converting most of the formulas in the template to values. Before consolidating Reagan's and the other managers' data, she retrieved Reagan's model (having upgraded her computer to 7 megabytes) and restored the formulas.

On another occasion, during the development phase, Koehn had to delete several hundred range names. In this instance, her range-naming scheme resembled a technique used in traditional languages, known as subscripting, which lets you create a set of variables in which only the last one or two characters differ. But *1-2-3* does not offer wild-card matching while deleting range names. She ended up deleting the range names manually.

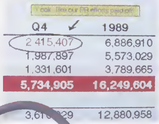
Despite its limitations, this powerful and sophisticated information system has been welcomed by users familiar with *1-2-3*. Designed to take full advantage of Release 3, the system will undoubtedly be modified once Release 3.1 with *WYSIWYG* is available. Barring any dramatically new spreadsheet programs, it should serve Deere's computer operations' needs for a long time. ■

A palette of 224 dazzling colors – more than any other spreadsheet – to make your graphics as powerful as your words.





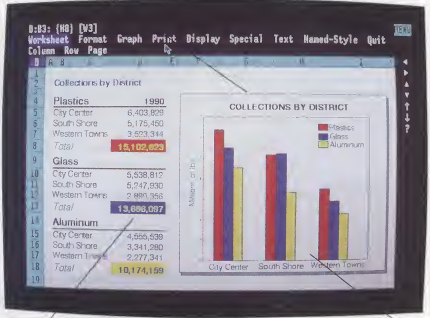
Only Release 3.1 offers an auto-compress feature that quickly reduces larger worksheets so they print on a single page.



Q4 ✓	1989
2,415,407	6,886,910
1,987,897	5,573,029
1,331,601	3,789,665
5,734,905	**16,249,604**
3,61[illegible]29	12,880,958

Our Graph Editor lets you add freehand drawings or symbols to call attention to critical data.

Create drop shadows, borders and legends.



```
D:B3: {H8} [W3]
Worksheet  Format  Graph  Print  Display  Special  Text  Named-Style  Quit
Column  Row  Page
```

Collections by District

Plastics	1990
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623
Glass	
City Center	5,538,812
South Shore	5,247,930
Western Towns	2,899,356
Total	13,686,097
Aluminum	
City Center	4,555,539
South Shore	3,341,280
Western Towns	2,277,341
Total	10,174,159

Use a mouse or the keyboard. It's up to you.

Combine a variety of colors, type styles and formats.

The WYSIWYG world of Release 3.1, with its Impress technology, means what you see on screen is exactly what you get when you print your work.

Display "live" graphs anywhere on the spreadsheet.

Think Graphically. Think An

Welcome to the world of Lotus 1-2-3 Release 3.1. Where you'll immediately discover the ease-of-use of a graphical environment, complete with mouse support and full WYSIWYG display. In fact, Release 3.1 gives you so many creative options, you'll actually find using it fun.

Of course, you'll also find all the powerful analytical features that have made Lotus 1-2-3 the best-selling spreadsheet in the world. Like our unique 3D technology and access to external databases.

But it doesn't end there. Because Release 3.1 also delivers the most impressive output imaginable. Along with the widest range of spreadsheet formatting options available. Which means you have complete control over how you want your work to look.

And even more importantly, we've

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To Order Your Upgrade

To upgrade to 1-2-3, Release 3.1, complete the order form below. *(Important: see reverse side for mailing instructions.)*

Name ______________________
Company ______________________
Address ______________________
City ____________ State _____ Zip _______

Upgrade offer available to current 1-2-3 users only. First-time buyers should see a Lotus Authorized Reseller.

	Qty[1]	*Media*	*Part No.*	*Price*	*Total*
If upgrading from Release 1A, 2, or 2.01:	____ ____	5.25″ 3.5″	XBQ-9500 XBQ-9505	$150 $150	____ ____
If upgrading from Release 2.2:	____ ____	5.25″ 3.5″	XBQ-9510 XBQ-9515	$75[2] $75[2]	____ ____
If upgrading from Release 3:	____ ____ ____ ____	5.25″ 3.5″ 5.25″ 3.5″	XBQ-9520 XBQ-9525 XBQ-9530 XBQ-9535	$35[2] $35[2] FREE[3] FREE[3]	____ ____ ____ ____
				Sub-Total	____
				Tax[4]	____
				Total	____

Method of Payment:

☐ Check (Payable to Lotus Development Corporation)
☐ Purchase Order (Original P.O. must accompany this form. Minimum purchase order amount is $100.)[5]
☐ American Express ☐ Visa ☐ MasterCard

Credit Card # |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| Exp. Date |_|_|-|_|_|

Signature ______________________ Phone (   ) ____________ Date __________
Required for all credit card orders

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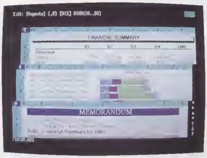
Windows 3.0. Just click the icon and you're on your way.



Our unique 3D technology. It's the best way to organize your work, link files, consolidate data, or create multi-page reports.

Collections by District

Plastics	**1990**
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623
Glass	
City Center	5,538,812
South Shore	5 247,930
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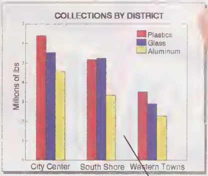

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Upgrade Center G
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Cambridge, MA 02139-9130

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[2] Special price offer for Release 2.2 and Release 3 users ends 12/31/90.

[3] If you purchased 1-2-3 Release 3 on or after May 7, 1990, you are eligible for a free upgrade to Release 3.1. You must redeem your free upgrade by 12/31/90 and include your 1-2-3 System Disk and original, dated store receipt with this form as proof-of-purchase.

[4] Plus applicable sales tax in the following states: Arizona, California, Colorado, Connecticut, Florida, Georgia, Illinois, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, Washington (state).

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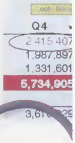

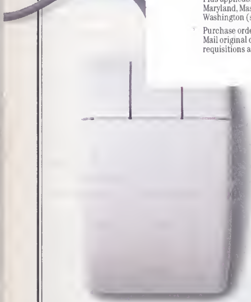

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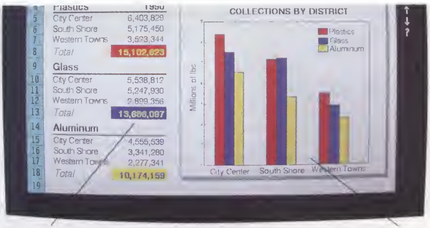

	Plastics	1990
5	City Center	6,403,829
6	South Shore	5,175,450
7	Western Towns	3,523,344
8	Total	15,102,623
9	Glass	
10	City Center	5,538,812
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14	Aluminum	
15	City Center	4,555,539
16	South Shore	3,341,280
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18	Total	10,174,159
19		

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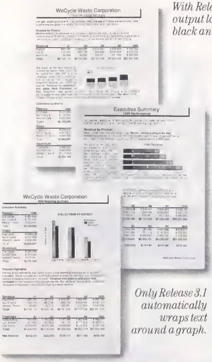

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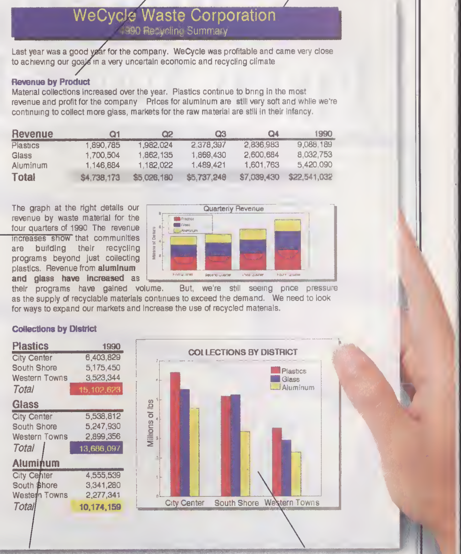

WeCycle Waste Corporation

1990 Recycling Summary

Last year was a good year for the company. WeCycle was profitable and came very close to achieving our goals in a very uncertain economic and recycling climate

Revenue by Product

Material collections increased over the year. Plastics continue to bring in the most revenue and profit for the company Prices for aluminum are still very soft and while we're continuing to collect more glass, markets for the raw material are still in their infancy.

Revenue	Q1	Q2	Q3	Q4	1990
Plastics	1,890,785	1,982,024	2,378,397	2,836,983	9,088,189
Glass	1,700,504	1,862,135	1,869,430	2,600,684	8,032,753
Aluminum	1,146,884	1,182,022	1,489,421	1,601,763	5,420,090
Total	$4,738,173	$5,026,180	$5,737,248	$7,039,430	$22,541,032

The graph at the right details our revenue by waste material for the four quarters of 1990 The revenue increases show that communities are building their recycling programs beyond just collecting plastics. Revenue from **aluminum and glass have increased** as their programs have gained volume. But, we're still seeing price pressure as the supply of recyclable materials continues to exceed the demand. We need to look for ways to expand our markets and increase the use of recycled materials.

Collections by District

Plastics	1990
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623
Glass	
City Center	5,538,812
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City Center	4,555,539
South Shore	3,341,280
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Total	10,174,159

Only Release 3.1 automatically wraps text around a graph.

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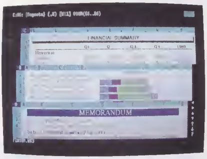

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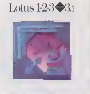

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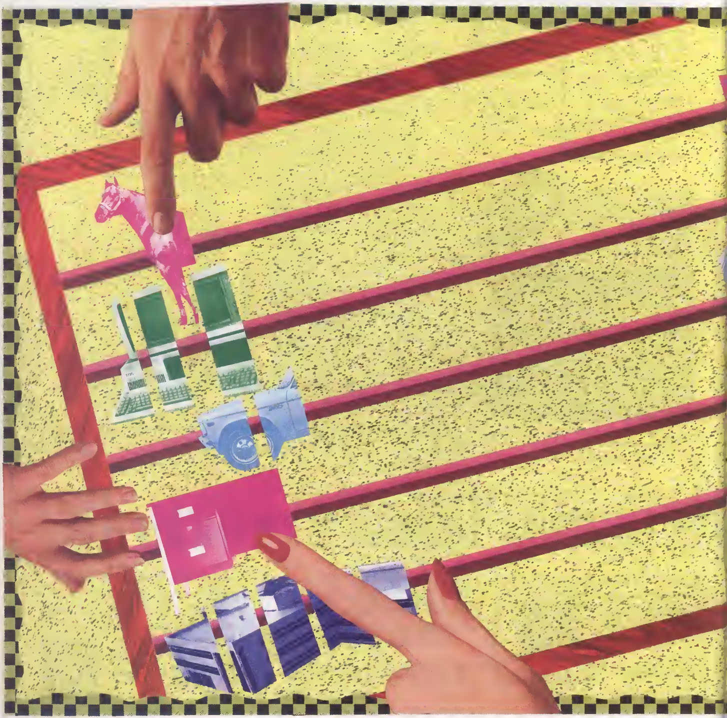
BUILDING A FIXED-ASSET REGISTER

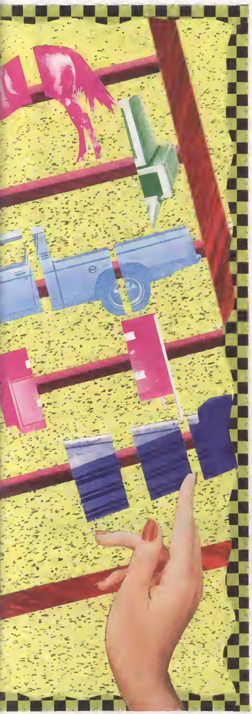


MARCIA STIEGER

APPLICATIONS

Spreadsheet depreciation functions can tell you the value of what's on your company's books.

BY KELLY CONATSER



It's the question that can make any business owner sweat. Your loan request seems reasonable, your company a good credit risk. But just what, the bank wants to know, might your business have in the way of collateral?

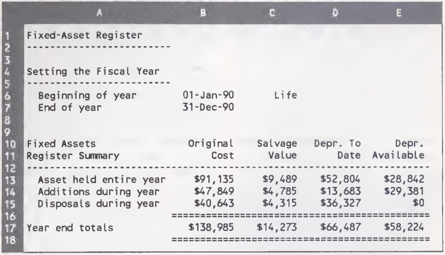
Part of the answer lies with your fixed assets, the durable goods that are placed in service for more than one year. Even service-oriented professions, such as accounting and consulting, rely on computers, copiers, fax machines, office furniture, and other fixed assets to keep their operations running smoothly. Yet many small businesses don't have any idea what their fixed assets are worth. This can be a problem when it's time to construct a balance sheet or to collateralize that all-important loan.

The best measure of a fixed asset's worth is its market value: What's the going price for this five-year-old Selectric? And this laser printer? And what about our office furniture? But researching the market values of even a few assets in this way could quickly become an imprecise and unmanageable task.

That's where tracking depreciation comes in handy. "Making Sense of Depreciation," in the September issue, explains the basics of depreciation and how to depreciate assets yearly by using *1-2-3* and *Symphony* @functions. You can also use these functions to calculate the cumulative depreciation of an asset. By subtracting cumulative depreciation from the asset's original cost, you get an estimate of the asset's current worth.

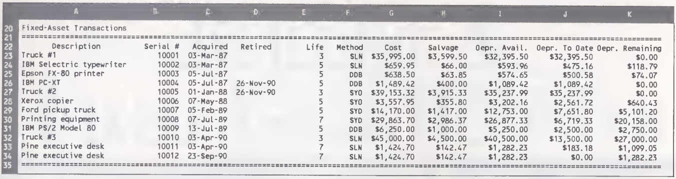
Estimating an asset's value in this way isn't as exact as researching market value. However, if you're using reasonable depreciation methods, it's a good substitute—one that is usually accepted by bankers who make loan decisions and by accountants who construct balance sheets. What's more, the process can easily be automated with a *1-2-3* or *Symphony* macro, so you can calculate the current worth of hundreds of assets in just a few seconds.

To build this macro and the fixed-asset



```
                 A                 B          C          D          E
 1  Fixed-Asset Register
 2  ------------------------
 3
 4  Setting the Fiscal Year
 5  ------------------------
 6    Beginning of year        01-Jan-90      Life
 7    End of year              31-Dec-90
 8
 9
10  Fixed Assets                Original   Salvage  Depr. To      Depr.
11  Register Summary                Cost     Value      Date  Available
12  -----------------------------------------------------------------
13    Asset held entire year     $91,135    $9,489   $52,804    $28,842
14    Additions during year      $47,849    $4,785   $13,683    $29,381
15    Disposals during year      $40,643    $4,315   $36,327         $0
16                          ==========================================
17  Year end totals             $138,985   $14,273   $66,487    $58,224
18                          ==========================================
```

Figure 1. The fixed-asset register summary estimates the current worth of all of your company's fixed assets, based on their depreciation status. By entering a number in cell C7, you can view a summary of any asset class. When cell C7 is blank, the summary includes all asset classes



	A	B	C	D	E	F	G	H	I	J	K
20	Fixed-Asset Transactions										
21	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========
22	Description	Serial #	Acquired	Retired	Life	Method	Cost	Salvage	Oepr. Avail.	Oepr. To Oate	Oepr. Remaining
23	Truck #1	10001	03-Mar-87		3	SLN	$35,995.00	$3,599.50	$32,395.50	$32,395.50	$0.00
24	IBM Selectric typewriter	10002	03-Mar-87		5	SLN	$659.95	$66.00	$593.96	$475.16	$118.79
25	Epson FX-80 printer	10003	05-Jul-87		5	DDB	$638.50	$63.85	$574.65	$500.58	$74.07
26	IBM PC-XT	10004	05-Jul-87	26-Nov-90	5	DDB	$1,489.42	$400.00	$1,089.42	$1,089.42	$0.00
27	Truck #2	10005	01-Jan-88	26-Nov-90	3	SYO	$39,153.32	$3,915.33	$35,237.99	$35,237.99	$0.00
28	Xerox copier	10006	07-May-88		5	SYO	$3,557.95	$355.80	$3,202.16	$2,561.72	$640.43
29	Ford pickup truck	10007	05-Feb-89		5	SYD	$14,170.00	$1,417.00	$12,753.00	$7,651.80	$5,101.20
30	Printing equipment	10008	07-Jul-89		7	SYD	$29,863.70	$2,986.37	$26,877.33	$6,719.33	$20,158.00
31	IBM PS/2 Model 80	10009	13-Jul-89		5	DDB	$6,250.00	$1,000.00	$5,250.00	$2,500.00	$2,750.00
32	Truck #3	10010	03-Apr-90		3	SLN	$45,000.00	$4,500.00	$40,500.00	$13,500.00	$27,000.00
33	Pine executive desk	10011	03-Apr-90		7	SLN	$1,424.70	$142.47	$1,282.23	$183.18	$1,099.05
34	Pine executive desk	10012	23-Sep-90		7	SLN	$1,424.70	$142.47	$1,282.23	$0.00	$1,282.23
35	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========

Figure 2. You enter data for each of your assets in columns A through H of this transactions database, then press MACRO-A to fill in depreciation-to-date figures in column J. Depreciation available and depreciation remaining are recalculated automatically by formulas in columns I and K.

register that works with it, use the instructions in the setup box. The macro works in *1-2-3* Releases 2.01 and higher and in *Symphony* Releases 2/2.2.

For Quick Results, Register Here

Figure 1 presents a summary of all assets listed in the Fixed-Asset Transactions database, which is shown in figure 2. The @DSUM formulas in ranges B13..D15 and E13..E14 calculate the original cost, salvage value, depreciation to date, and depreciation available for assets held for the entire fiscal year, assets acquired during the fiscal year, and assets disposed of during the fiscal year. The criteria ranges for these @DSUM formulas are located in range H3..I10, shown in figure 3. Cell E15 always equals 0 because there is no depreciation available on an asset that has already been disposed of.

The summary can be used for all assets in the transactions database or for any fixed-asset class. Cell C7 is blank, which means that this summary covers all the assets in the database. To calculate a summary for any particular class of asset, enter that asset class in cell C7. To summarize assets with a seven-year class life, for example, enter *7* in cell C7. The formula in cell C4 immediately displays the message *Press Alt-U to update the worksheet.* Hold down the MACRO key (Alt on most computers) and press U. The message disappears, and the formulas in range B13..E15 calculate depreciation for the seven-year assets in the transactions database. To return to a summary of all fixed assets, simply erase cell C7 and press MACRO-U.

The bottom line of the summary, range B17..E17, is a snapshot of the company's fixed-asset base. The formulas in this range add together the numbers in rows 13 and 14 to get ending totals for the company's assets. Disposals are ignored in this calculation because they are no longer part of the company's fixed-asset base.

In this example, $138,985 represents the original cost of the fixed assets that the company is holding at the end of the fiscal year. Of that amount, $66,487 has already been depreciated. There is $58,224 worth of depreciation remaining on these assets, and the company expects to recoup $14,273 in cash when it sells the assets at the end of their useful lives.

Entering the Data

Figure 2 shows the Fixed-Asset Transactions database, which contains information on individual assets. Except for the dates that define your fiscal year, which you enter in range B6..B7, you enter all data for the model in this database.

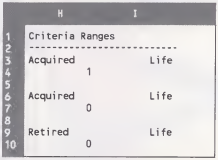
You enter descriptions, serial numbers, acquisition dates, and retirement dates for each asset in columns A through D. If the asset is still in service, do not enter a retirement date in column D.

Enter the asset's class life and the depreciation method you have selected for it in columns E and F. Depreciation methods should be entered as strings: SLN for straight-line depreciation, SYD for sum-of-the-years'-digits, and DDB for double-declining balance. If you don't know which method to choose, refer to the September article on depreciation.

Enter the asset's cost in column G and its estimated salvage value in column H. This example estimates salvage for most items at 10% of the original cost, but actual salvage proportions vary from asset to asset.

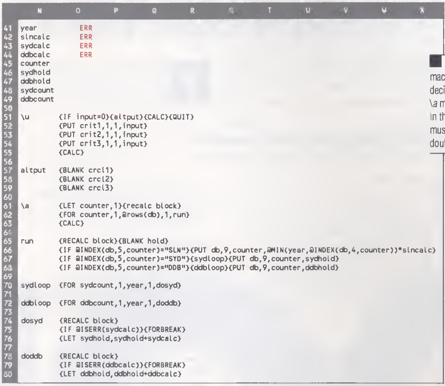
When data entry is complete, press MACRO-A to calculate the depreciation to date for each asset. The \a macro shown in figure 4 uses nested FOR loops to calculate the accumulated depreciation for each asset, based on the asset's class life and the amount of time it has been in service.

The Xerox copier in row 28 of the database provides a good example of how an asset's depreciation to date, found in column J, is calculated. The macro processes range *db*, the transactions database, row by row. At each new row, the macro first recalculates the formula in *year* (which is part of the range *block*) to find the number of years that the asset has been in service. The Xerox copier was placed in service on May 7, 1988. The formula in *year* subtracts this date from *endyear*, the end of the fiscal year specified in cell B7, and rounds the result to the nearest integer. Thus the copier, which has actually been in service for about 2.65 years, is considered to have



	H	I
1	Criteria Ranges	
2	-------------------------	
3	Acquired	Life
4	1	
5		
6	Acquired	Life
7	0	
8		
9	Retired	Life
10	0	

Figure 3. These criteria ranges are essential to the @DSUM formulas in ranges B13..D15 and E13..E14.



```
      N         O         P         Q         R         S         T         U         V         W         X
41  year           ERR
42  slncalc        ERR
43  sydcalc        ERR
44  ddbcalc        ERR
45  counter
46  sydhold
47  ddbhold
48  sydcount
49  ddbcount
50
51  \u         {IF input=0}{altput}{CALC}{QUIT}
52             {PUT crit1,1,1,input}
53             {PUT crit2,1,1,input}
54             {PUT crit3,1,1,input}
55             {CALC}
56
57  altput     {BLANK crcl1}
58             {BLANK crcl2}
59             {BLANK crcl3}
60
61  \a         {LET counter,1}{recalc block}
62             {FOR counter,1,@rows(db),1,run}
63             {CALC}
64
65  run        {RECALC block}{BLANK hold}
66             {IF @INDEX(db,5,counter)="SLN"}{PUT db,9,counter,@MIN(year,@INDEX(db,4,counter))*slncalc}
67             {IF @INDEX(db,5,counter)="SYD"}{sydloop}{PUT db,9,counter,sydhold}
68             {IF @INDEX(db,5,counter)="DDB"}{ddbloop}{PUT db,9,counter,ddbhold}
69
70  sydloop    {FOR sydcount,1,year,1,dosyd}
71
72  ddbloop    {FOR ddbcount,1,year,1,doddb}
73
74  dosyd      {RECALC block}
75             {IF @ISERR(sydcalc)}{FORBREAK}
76             {LET sydhold,sydhold+sydcalc}
77
78  doddb      {RECALC block}
79             {IF @ISERR(ddbcalc)}{FORBREAK}
80             {LET ddbhold,ddbhold+ddbcalc}
```

Figure 4. These two macros update the worksheet. The \u macro in cell O51 refreshes the formulas in figure 1 when you decide to calculate summary totals for a different asset class. The \a macro in cell O61 calculates depreciation to date for each item in the asset register. For these macros to work properly, range *db* must include each item in the database, as well as the row of double-dashed lines at the bottom.

been in service for 3 years by the macro.

The macro then checks column 5 of *db* (in this case, column F) to see what method of depreciation is being used for the asset. Cell F28 contains the label *SYD*, which means the copier is being depreciated using the sum-of-the-years'-digits method.

The macro executes *sydloop*, the FOR loop pertaining to sum-of-the-years'-digits depreciation. To obtain the cumulative depreciation for the copier, the macro must calculate the depreciation for the first year, then calculate the depreciation for the second year, add those together, and so on. This process, embodied in the *dosyd* subroutine, continues until the depreciation amount for each year that the copier has been in service (in this case, years 1, 2, and 3) has been added to the total.

The result, $2,561.72, is placed in column J of row 28. You would get the same result if you calculated the copier's first-, second-, and third-year depreciation totals ($1,067.38, $853.91, and $640.43) and added them manually.

The macro won't overdepreciate an asset. For example, depreciation on Truck #1 (row 23) has stopped even though the truck continues to operate beyond its expected three-year life. In addition, if an asset has been retired before the end of its useful life, @IF formulas in column K guarantee that the remaining depreciation for that asset will equal 0.

The two identical desks listed in rows 33 and 34 show the effect of the @ROUND formula contained in *year*. The first desk, purchased more than six months before the end of the current fiscal year, receives a full year's depreciation. The second desk, purchased less than six months before the end of the current fiscal year, is not depreciated at all.

A tax accountant would do things differently. There would always be some depreciation of an asset purchased in the current tax year, such as the desk in row 34. Because this macro estimates the values of several assets and does not calculate tax expenses, this level of precision isn't required.

If your fixed-asset purchases are scattered randomly throughout the calendar year, the distortions that are created by the @ROUND formula in *year* tend to offset each other. Thus, the number in cell D14 representing depreciation to date on assets added during the current fiscal year can serve as a rough estimate of your depreciation expenses for the fiscal year. But this is *not* the depreciation number you would list on your tax form.

Modifying the Database

It's easy to adapt the model to your circumstances. To add rows to the Fixed-Asset Transactions database, place the cell pointer in the row containing the dashed lines at the bottom of the database (in this case, row 35). Select /Worksheet Insert Row (in *Symphony*, MENU Insert Rows) and indicate the number of extra rows needed. Enter your data in columns A through H, then press MACRO-A to update the database. Remember that you must press MACRO-A to update the database each time you add an entry or edit an existing entry.

To delete a row that contains an asset that has been disposed of, place the cell pointer in that row, select /Worksheet Delete Row (in *Symphony*, MENU Delete Rows), and press Return.

By inserting and deleting rows within the transactions database, you automatically expand or contract range *db*. This range must always contain the database field names (in row 22), all the database records, and the double-dashed lines at the bottom of the database for the \a macro to work properly.

If you add columns to the database—containing, for example, the asset's geo-

> *Many small businesses don't have any idea what their fixed assets are worth.*

graphical location or the name of its vendor—it's best to position them to the right of the current database. If you insert columns to the left of column K, you'll have to change the column-offsets in the PUT statements and @INDEX formulas in the macro.

This model encompasses the three depreciation functions that were covered in the September primer on depreciation: @SLN, @SYD, and @DDB. A fourth, @VDB, measures variable-declining balance. This function is available only in *1-2-3* Release 3 and therefore isn't included in the macro. However, sophisticated macro programmers using Release 3 will be able to extend the logic of this macro to include @VDB as a fourth depreciation choice.

LOTUS The model described in this article is available on disk. See page 16 for details.

HOW TO SET UP THE FIXED-ASSET REGISTER

1. Releases

This model works in *1-2-3* Releases 2.01 and higher and in *Symphony* Release 2/2.2.

2. Global settings

Cell format: Fixed 0.
Select /Worksheet Global Fixed, enter *0*. (*Symph:* MENU Settings Format Fixed, enter *0*, and select Quit.)

3. Column widths

Column	***Width***
A	25
B	12
C	11
D	11
E	11
G	12
H	12
I	14
J	15
K	15

For example, to set the width of column A, place the cell pointer in column A, select /Worksheet Column Set-Width (*Symph:* MENU Set Width), and then enter *25*.

4. Cell formats

Format	***Range***
Date 1	B6..B7, C23..D34
Currency 0	B13..E17
Currency 2	G23..K34

For example, to assign the Date 1 format to cell B6..B7, select /Range Format Date 1 (*Symph:* MENU Format Date 1), indicate range B6..B7, and press Return.

5. Labels

Enter the labels in figures 1 through 4. Do not enter the labels that appear in color. Begin the labels in ranges A6..A7 and A13..A15 with two spaces.

To create the rows of dashed lines, enter \- in cell A2 and copy it as necessary. To create the rows of double dashed lines, enter \= in cell B16 and copy it as necessary.

To align the labels to match the figures, select /Range Label Right (*Symph:* MENU Range Label-Alignment Right) and indicate ranges C6, B10..E11, B22..C22, E22..F22, F23..F34, and I3..I9. Select /Range Label Center (*Symph:* MENU Range Label-Alignment Center) and indicate ranges A22, D22, and G22..J22.

6. Values

Enter the values in cells E15 and B23, and in ranges E23..E34 and G23..H34.

7. Date values

Enter the dates in ranges B6..B7 and C23..D34 using the @DATE formula. The syntax of this formula is @DATE(*yy*,*mm*,*dd*). For example, to produce the date in cell B6, enter the formula @DATE(90,1,1).

8. Range names

Name	***Range***	***Name***	***Range***
db	A22..K35	*year*	041
startyear	B6	*slncalc*	042
endyear	B7	*sydcalc*	D43
input	C7	*ddbcalc*	044
crit1	H3..I4	*counter*	045
crit2	H6..I7	*sydhold*	046
crit3	H9..I10	*ddbhold*	047
crcl1	I4	*sydcount*	048
crcl2	I7	*ddbcount*	049
crcl3	I10	*\u*	051
block	041..044	*altput*	D57
hold	046..047	*\a*	061
		run	065
		sydloop	070
		ddbloop	072
		dosyd	D74
		doddb	078

Use the Range Name Create command to assign the names in the first group For example, to assign the name *db*, press /(*Symph:* MENU), select Range Name Create, enter *db*, and specify range A22..K35.

To assign the names in the second group, press /(*Symph:* MENU), select Range Name Labels Right, and indicate range N41..N78.

9. Formulas

Cell	***Formula***
C4	@IF(input=@INDEX(crit1,1,1)," ", "Press Alt-U to update the worksheet")
B13	@DSUM($db,6,crit1)
B14	@DSUM($db,6,crit2)
B15	@DSUM($db,6,crit3)
C13	@DSUM($db,7,crit1)
C14	@DSUM($db,7,crit2)
C15	@DSUM($db,7,crit3)
D13	@DSUM($db,9,crit1)
D14	@DSUM($db,9,crit2)
D15	@DSUM($db,9,crit3)
E13	@DSUM($db,10,crit1)
E14	@DSUM($db,10,crit2)
B17	+B13+B14

Copy cell B17 to range C17..E17.

B24	+B23+1

Copy cell B24 to range B25..B34.

I23	+G23-H23
K23	@IF(@CELL("type",D23)<> "b"#AND#B$5>=D23,0,I23-J23)

Copy range I23..K23 to range I24..I34.

H4	+C23<$startyear#AND#D23=0
H7	+C23>=$startyear#AND#C23<=$endyear
H10	+D23>=$startyear#AND#D23<=$endyear
O41	@ROUND((endyear-@INDEX (db,2,counter))/365,0)
O42	@SLN(@INDEX(db,6,counter),@INDEX (db,7,counter),@INDEX(db,4,counter))
O43	@SYD(@INDEX(db,6,counter),@INDEX (db,7,counter),@INDEX(db,4,counter), sydcount)
O44	@DDB(@INDEX(db,6,counter),@INDEX (db,7,counter),@INDEX(db,4,counter), ddbcount)

10. Run the macro

Press MACRO-A to run the macro. Your results should match those in figures 1 and 2.

Count the ways.

123

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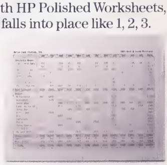

HEWLETT PACKARD

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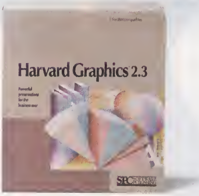

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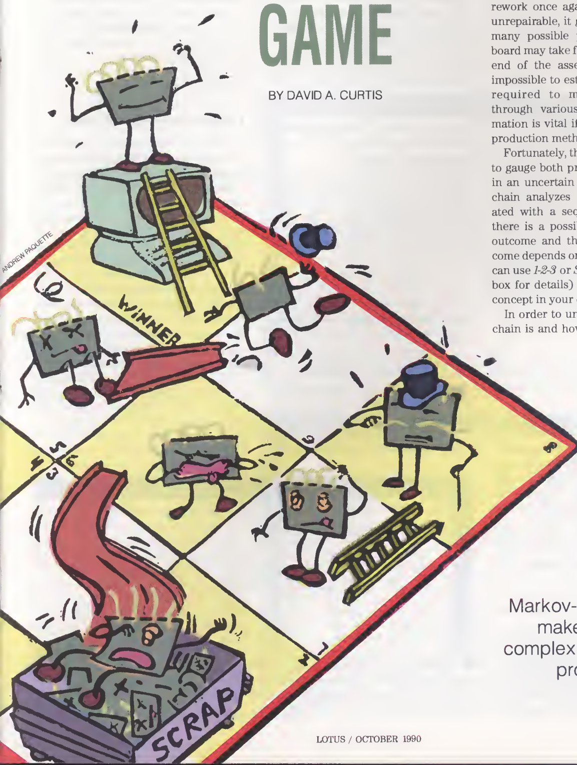
How To WIN *the* PRODUCTION GAME

BY DAVID A. CURTIS



ANDREW PAQUETTE

Hyrax Industries manufactures electronic instruments that use printed circuit boards (PCBs). Production of these instruments is divided into several steps, and Hyrax tests the boards and the finished components at the end of each step. Whenever it finds a defective unit, production sends it to a rework area to be repaired, the reworked unit is tested again, and some of these are sent back to rework once again. If a unit is deemed unrepairable, it gets scrapped. Given the many possible paths a printed circuit board may take from the beginning to the end of the assembly line, it is nearly impossible to estimate the average times required to move the instruments through various steps. But this information is vital if Hyrax is to improve its production methods.

Fortunately, there is a model that helps to gauge both production time and yield in an uncertain environment. A Markov chain analyzes the probabilities associated with a sequence of events. When there is a possibility of more than one outcome and the probability of an outcome depends on previous outcomes, you can use *1-2-3* or *Symphony* (see the setup box for details) to apply a Markov-chain concept in your own environment.

In order to understand what a Markov chain is and how it works, let's examine

Markov-chain analysis makes sense of complex manufacturing processes.

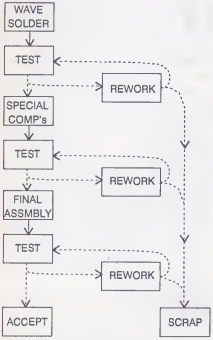


Figure 1. This diagram shows the possible paths of PCB-based components at Hyrax Industries. It illustrates how difficult it is to develop decision trees for certain types of production flows. The solid lines represent single paths from one step to the next. The dotted lines indicate one of two paths an item can follow. Since an item may move from a test area to the next production step or to rework and may go to rework more than once, the number of possible paths is extremely large.

electronic-instrument production at Hyrax Industries.

A Tortuous Path

PCBs are fiberglass sheets with electronic components attached. The components are connected to each other by fine metallic tracks on the surface of the PCB. At Hyrax, the three major steps in the manufacturing process are:

- Attaching most components to the PCB in a process called wave soldering
- Adding special components that cannot be wave soldered
- Installing the PCB in a cabinet and adding terminals, meters, potentiometers, and so forth

After each step, the units are tested to determine whether they will go to the next step or to the rework area. Figure 1 illustrates the manufacturing sequence. The solid lines represent a nonvariable path a component takes; the dotted lines indicate one of two possible paths. For example, a wave-soldered board always goes from wave soldering to the test area, but a tested board can go either to the next production step or to rework. That board, when it leaves rework, can go back to the test area or to scrap.

Figure 1 illustrates, but does not help to analyze, the process. Calculating the average time to test and rework a unit using some sort of decision tree would take a very long time. Accurately estimating the scrap rate would be equally tedious.

By contrast, the Markov-chain method analyzes the probabilities mathematically. The theory behind this model was developed by Andrey Andreyevich Markov, a mathematician of pre-Soviet Russia. Today this method is used at many large manufacturing companies, particularly in the electronics industry.

Analyzing a system with a Markov chain is a form of solving simultaneous equations, using matrices. For example, to solve for x and y where $3x + 7y = 17$ and $7x - 3y = 1$, arrange the coefficients of the variables in a two-by-two matrix:

$$\begin{matrix} 3 & 7 \\ 7 & -3 \end{matrix}$$

Most square matrices have an inverse matrix, derived through a complex algorithm. The inverse of the above matrix is:

$$\begin{matrix} 0.05172 & 0.12069 \\ 0.12069 & -0.05172 \end{matrix}$$

To solve for x and y, arrange the right sides of the equations in a two-by-one matrix:

$$\begin{matrix} 17 & 1 \end{matrix}$$

Then perform a matrix multiplication, using the inverse matrix as the first matrix and the one-by-two matrix as the second matrix. The result is another two-by-one matrix:

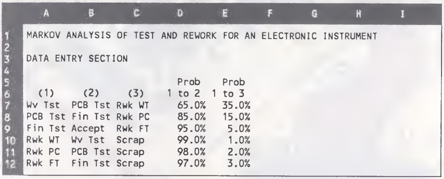
$$\begin{matrix} 1 \\ 2 \end{matrix}$$

Using 1 for x and 2 for y solves both of the equations. You can easily perform matrix-inversion and matrix-multiplication operations in *1-2-3* and *Symphony* with the statistical add-in STAT.APP attached. As you'll see, using matrix operations to develop Markov-chain models is only a bit more complex than the example just demonstrated.

The Markov-Chain Approach

Start the process by creating a table of the probabilities that an item will move from one step to another.

The table in figure 2 lists the probabilities for the Hyrax Industries example. When an item is tested after being wave soldered (*Wv Tst*), it can go to special-components assembly and from there to PCB testing (*PCB Tst*), or it can go to the wave-solder rework area (*Rwk WT*). Hyrax's production engineers have found that there is a 65% chance that the board will go to *PCB Tst*, so *.65* is entered in cell D7. Cell E7 contains the formula 1–D7, which returns 35%. Now look at row 10. There is a 99% chance that a board will go from *Rwk WT* back to *Wv Tst*, so *.99* is entered in cell D10. If the board doesn't return to *Wv Tst*, it goes to scrap, so the formula 1–D10, which returns 1%, is entered in cell E10. The name *table* is assigned to range A7..E12.



```
     A        B        C        D        E        F        G        H        I
1   MARKOV ANALYSIS OF TEST AND REWORK FOR AN ELECTRONIC INSTRUMENT
2
3   DATA ENTRY SECTION
4
5                                 Prob      Prob
6     (1)      (2)      (3)     1 to 2   1 to 3
7   Wv Tst   PCB Tst  Rwk WT     65.0%    35.0%
8   PCB Tst  Fin Tst  Rwk PC     85.0%    15.0%
9   Fin Tst  Accept   Rwk FT     95.0%     5.0%
10  Rwk WT   Wv Tst   Scrap      99.0%     1.0%
11  Rwk PC   PCB Tst  Scrap      98.0%     2.0%
12  Rwk FT   Fin Tst  Scrap      97.0%     3.0%
```

Figure 2. This is the data entry section for the Markov-chain worksheet. Column A lists source locations for an electronic component, and columns B and C list the possible destinations. Column D contains the probabilities that a unit will go from its source to the destination named in column B. Column E contains formulas that compute the probability of a unit going to its other possible destination.

Once this table is set up, you rearrange the numbers into an array, shown in the upper half of figure 3. The array conveys the same information as figure 1. The only difference is that the numbers are arranged in a row-and-column format. For example, cell C25, at the intersection of the *Wv Tst* row and the *PCB Tst* column, returns 65%, the same value that is in cell D7 of figure 2. These values are generated by formulas using the @VLOOKUP function. These formulas find values from the range named *table*.

Because the locations listed in range A25..A30 can be either a source or a destination, the same set of locations is listed along row 24 in columns B through G. The extra two columns of probabilities are for the two absorbing steps, the steps from which there is no exit. These must be at the right side of the array.

Using the first six columns of the array, produce the six-by-six cell matrix shown in the lower half of figure 3. In this matrix, there is a 1 in every cell in which the row and column headings are the same. All the other cells contain the negative of the corresponding value from the array in rows 24 through 30.

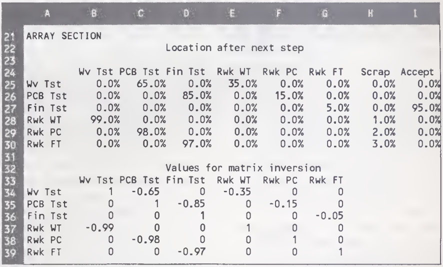
Now you invert this matrix by selecting /Data Matrix Invert (in *Symphony*, MENU Range Matrix Invert). We'll look at this in more detail later. Inverting the matrix produces another matrix, shown in figure 4. You use this matrix as part of a matrix multiplication, but you also use the values in its top row to calculate the time it takes an item to pass through each step.

For example, the nominal time for a circuit board to go through the wave-solder test is 1.25 minutes (1 minute and 15 seconds). This value is entered in cell B51. However, since some of the boards are diverted through rework, the actual average time is somewhat longer. The value in cell B44, placed there by the matrix-inversion operation, indicates that the nominal time must be increased by a factor of 1.53. The formula in cell B53 multiplies the values in cells B51 and B44, indicating that the actual time is 1.91 minutes (about 1 minute and 55 seconds). Similarly, the nominal times of 2 minutes and 3 minutes for PCB final testing are increased to 2.33 and 3.13 minutes.

The remaining values in row 51 are the times a unit is expected to be in the three rework areas. Because not all units go through rework, the factors in range E44..G44 are less than one, and the actual times in range E53..G53 are less than the nominal times.

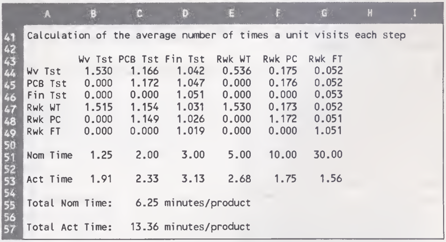
Because, ideally, no units would go through rework, the total-nominal-time formula in cell C55 sums only the first three values in row 51. The total-actual-time formula in cell C57 includes the time that units spend in rework, so it sums all six values in row 53. The total actual time is approximately 2.14 times greater than the ideal time a unit should spend in test areas. The matrices indicate that Hyrax has a lot of work to do to bring the actual time closer to the ideal.

The final step is to multiply the six-by-six matrix in figure 4 by the six-by-two matrix formed by the entries in range H25..I30 of figure 3. This produces the six-by-two matrix in figure 5. The two topmost values in this matrix are the probabilities of a unit going from the beginning of the process to, respectively, scrap and acceptance. Cells B64 and C64 indicate that 1.04% of the units will be scrapped, and therefore 98.96% of the units will be accepted. For clarity, the values are repeated in cells E71 and E73.



```
          A         B       C       D       E       F       G       H       I
21  ARRAY SECTION
22                              Location after next step
23
24            Wv Tst PCB Tst Fin Tst  Rwk WT  Rwk PC  Rwk FT   Scrap  Accept
25  Wv Tst      0.0%   65.0%    0.0%   35.0%    0.0%    0.0%    0.0%    0.0%
26  PCB Tst     0.0%    0.0%   85.0%    0.0%   15.0%    0.0%    0.0%    0.0%
27  Fin Tst     0.0%    0.0%    0.0%    0.0%    0.0%    5.0%    0.0%   95.0%
28  Rwk WT     99.0%    0.0%    0.0%    0.0%    0.0%    0.0%    1.0%    0.0%
29  Rwk PC      0.0%   98.0%    0.0%    0.0%    0.0%    0.0%    2.0%    0.0%
30  Rwk FT      0.0%    0.0%   97.0%    0.0%    0.0%    0.0%    3.0%    0.0%
31
32                              Values for matrix inversion
33            Wv Tst PCB Tst Fin Tst  Rwk WT  Rwk PC  Rwk FT
34  Wv Tst         1   -0.65       0   -0.35       0       0
35  PCB Tst        0       1   -0.85       0   -0.15       0
36  Fin Tst        0       0       1       0       0   -0.05
37  Rwk WT     -0.99       0       0       1       0       0
38  Rwk PC         0   -0.98       0       0       1       0
39  Rwk FT         0       0   -0.97       0       0       1
```

Figure 3. Rows 25 to 30 convert the table shown in figure 2 into an array of probabilities. Rows 34 to 39 convert the first six columns of the array into a six-by-six matrix that can be inverted with the Matrix Invert command.



```
          A         B       C       D       E       F       G       H       I
41  Calculation of the average number of times a unit visits each step
42
43            Wv Tst PCB Tst Fin Tst  Rwk WT  Rwk PC  Rwk FT
44  Wv Tst     1.530   1.166   1.042   0.536   0.175   0.052
45  PCB Tst    0.000   1.172   1.047   0.000   0.176   0.052
46  Fin Tst    0.000   0.000   1.051   0.000   0.000   0.053
47  Rwk WT     1.515   1.154   1.031   1.530   0.173   0.052
48  Rwk PC     0.000   1.149   1.026   0.000   1.172   0.051
49  Rwk FT     0.000   0.000   1.019   0.000   0.000   1.051
50
51  Nom Time    1.25    2.00    3.00    5.00   10.00   30.00
52
53  Act Time    1.91    2.33    3.13    2.68    1.75    1.56
54
55  Total Nom Time:     6.25 minutes/product
56
57  Total Act Time:    13.36 minutes/product
```

Figure 4. Rows 44 to 49 contain the result of inverting the matrix shown in figure 3. Its first row contains factors by which the nominal times a unit spends in each step (entered in row 51) must be adjusted. Row 53 contains formulas that compute the actual time a unit is likely to spend in each step. Cells C55 and C57 compute the totals of nominal and actual times.

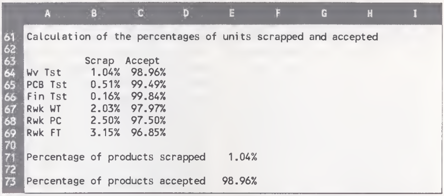
Some simple arithmetic can show you which production steps are contributing most to the scrap rate. To find out how much of the 1.04% scrap rate originates at *Wv Tst*, divide the percentage of units that go from *Wv Tst* to acceptance (98.96%) by the percentage that go from *PCB Tst* to acceptance (99.49%). The result, 99.47%, is the percentage of units that go from *Wv Tst* to *PCB Tst*. Subtract this from 100% and you see that 0.53% of the units in the scrap pile were sent there from *Wv Tst*. Next, divide the percentage of units that go from *PCB Tst* to acceptance (99.49%) by the number of units that go from *Fin Tst* to acceptance (99.84%). The result, 99.35%, is the percentage of units that go from *PCB Tst* to *Fin Tst*. Subtracting 99.35% from 100% results in 0.35%. That's the percentage of the units in the scrap pile that got there from *PCB Tst*. The value in cell B66, 0.16%, needs no adjustment. It's the percentage of units sent to *Fin Tst* that are scrapped. Add the values 0.53%, 0.35%, and 0.16% to get the scrap rate, 1.04%. Since the test that follows wave-soldering sends the highest percentage of units to scrap, that's where Hyrax must focus its corrective efforts.

Build the worksheet now from the setup box. When you've finished setting up the worksheet, ranges B44..G49 and B64..C69 will be empty, and the results of some formulas will not match the values shown in the figures. Read the paragraphs that follow to see how to use the Matrix commands to complete the Markov-chain analysis.

Using the Worksheet

If you use *Symphony*, you must attach the statistical add-in before proceeding. If you run *Symphony* from a hard disk, the file STAT.APP and the *Symphony* program files should be in the same directory. If you run *Symphony* from a floppy disk, place the Help and Tutorial Disk in drive A. Select SERVICES Application Attach, select STAT.APP from the menu, and select Quit.

Now select /Data Matrix Invert (in *Symphony*, MENU Range Matrix Invert), specify B34..G39 as the range to invert, and specify cell B44 as the Output range. In a few seconds, range B44..G49 will be filled with the values shown in figure 4. Then select /Data Matrix Multiply (in *Symphony*, MENU Range Matrix Multiply), specify range B44..G49 as the first range to multiply, specify range H25..I30 as the second range to multiply, and specify cell B64 as the Output range. Range B64..C69 will be filled with the values shown in figure 5.



```
      A        B       C       D       E       F       G       H       I
61  Calculation of the percentages of units scrapped and accepted
62
63              Scrap  Accept
64  Wv Tst      1.04%  98.96%
65  PCB Tst     0.51%  99.49%
66  Fin Tst     0.16%  99.84%
67  Rwk WT      2.03%  97.97%
68  Rwk PC      2.50%  97.50%
69  Rwk FT      3.15%  96.85%
70
71  Percentage of products scrapped     1.04%
72
73  Percentage of products accepted    98.96%
```

Figure 5. Range B64..C69 is the result of multiplying the inverted matrix, shown in figure 4, by the last two columns of the array of probabilities (the *Scrap* and *Accept* columns) shown in figure 3. The values in cells B64 and C64 are the probabilities that an item will move from the first test (following wave soldering) to the scrap pile and to acceptance. For clarity, these values are repeated in cells E71 and E73.

Now assume that Hyrax has improved the production process. There is now an 80% chance that a wave-soldered board will proceed to special components and a 95% chance that a completed board will proceed to final assembly. To adjust the worksheet, change the entries in cells D7 and D8 to *.8* and *.95*. Reissue the Matrix Invert and Matrix Multiply commands, using the same ranges as before. The total actual time, in cell C57, has dropped to 10.14 minutes. The percentage of scrapped units, in cell E71, has decreased from 1.04% to 0.51%.

Modifying the Worksheet

To adapt the worksheet for use in your own environment, start by replacing the entries in range A7..C12 with labels representing the origin and possible end points of a production unit. Enter as many labels as necessary, and add new worksheet rows as needed. In column D enter the probabilities that a unit will go from the points listed in column 1 to the points listed in column 2. For each step, make sure there is a formula in column E that subtracts the adjacent percentage from 1. Be sure to adjust the range *table* so that it includes all the entries you've made and assign the Percent format to additional values in columns D and E.

Next, adapt the array shown in figure 3. If necessary, create extra room by adding rows to the worksheet. For every row you add, add one column between columns G and H. Then replace the labels down the left side and along the top of the array. These must match the labels in the original table exactly. Use the Copy and Range Transpose commands to avoid errors. That is, copy the labels from column 1 in the data entry section to the left column of the array section. Then press slash (in *Symphony*, MENU), select Range Transpose, specify the labels on the left side of the array as the From range, and specify the top row of the array as the To range. If necessary, replace the labels *Scrap* and *Accept* with the names of your process's absorbing steps. Remember that the absorbing steps must be in the last two columns of the array. Finally, make additional copies of the formulas to accommodate any new rows and columns you've entered.

Modify the first matrix by copying the row and column labels (except the column labels for the absorbing steps) from the array to the cells to the left of and above the matrix. Be sure you've created some extra room for any additional rows you might add to the array. Then copy the matrix formulas to fill any additional rows and columns. Remember that this matrix must be square (it must have as many rows as columns) to be inverted. Replace the nominal times (initially in row 51) with values from your own operation. If necessary, adjust the formulas for total nominal time and total actual time. Total nominal time should exclude the time an item spends at any one step to which it would not, ideally, be sent. Total actual time sums all actual times.

Copy the row and column labels from the first matrix to the second matrix (figure 4). Then copy the row labels from the first matrix to the third matrix (figure 5). In both cases, be sure to allow enough room for any new rows. Copy the headings for the absorbing-step columns in the array (figure 3) to the row above the third matrix. Replace the labels shown in cells A71 and A73 of figure 5 with labels appropriate to your setting. Confirm that the formulas that accompany these labels repeat the values in the top two cells of the third matrix.

To recreate the matrices, select /Data Matrix Invert (in *Symphony*, MENU Range Matrix Invert), highlight the formulas in the first matrix, and specify the upper-left cell of the second matrix as the Output range. Then select /Data Matrix Multiply (in *Symphony*, MENU Range Matrix Multiply), highlight the values in the second matrix as the first range, highlight the formulas in the absorbing-step columns of the array as the second range, and specify the upper-left cell of the third matrix as the Output range.

Estimating the time needed for an activity and the chances of completing it are common tasks not only in manufacturing but in product development, sales, and other management disciplines.

In product development, for instance, the steps may include design study, initial design review, detailed design, critical design review, production engineering, and design release. In sales the steps may be customer contact, credit check, definition of needs, formal bid, negotiations, and contract execution. At every step, it may be necessary to repeat work, do extra work, or perhaps abandon the activity. But because of the similarities, you can apply the same mathematics to analyze management challenges in many disciplines.

David A. Curtis wrote about a time-analysis worksheet in the November 1989 issue. He is president of Curtis Associates, a Boxboro, Mass., management consulting firm.

The model described in this article is available on disk. See page 16 for details.

HOW TO BUILD THE MARKOV-CHAIN WORKSHEET

1. Releases
This model works in *1-2-3* Releases 2.01, 2.2, and 3 and in *Symphony* Releases 2.0 and 2.2.

2. Default settings
Column width: 8

1-2-3: /Worksheet Global Column-Width, enter *8*
Symph: MENU Settings Width, enter *8*, select Quit

3. Cell formats

Format	***Range***
Percent 1 *(Symph:* % 1)	D7..E12, B25..I30
Fixed 3	B44..G49
Fixed 2	B51..G51, B53..G53, C55, C57
Percent 2	B64..C69, E71, E73

For example, to assign the Percent format to range D7..E12, select

1-2-3: /Range Format Percent, enter *1*, and specify range D7..E12
Symph: MENU Format %, enter *1*, and specify range D7..E12

4. Labels
Enter the labels shown in figure 2. Where appropriate, be sure that the labels in columns B and C match their counterparts in column A. Begin each label in range A6..C6 with a caret (^). Begin each label in range D6..E6 with a quotation mark (").

Enter the labels shown in cells A21, D22, and D32 of figure 3. Copy range A7..A12 to cell A25. Then press / (*Symph:* MENU), select Range Transpose, specify range A25..A30 as the From range, and specify cell B24 as the To range. Then right-align the labels in row 24: Select /Range Label Right (*Symph:* MENU Range Label-Alignment Right) and specify range B24..G24. Copy range A24..G30 to cells A33 and A43. Copy range A25..A30 to cell A64. Enter the labels *Scrap* and *Accept* in cells H24 and I24, then copy range H24..I24 to cell B63.

Enter the labels shown in cell A41 and range A51..A57 of figure 4. Enter the label *minutes/product* in cell D55, and copy cell D55 to cell D57.
Enter the labels shown in cells A61, A71, and A73 of figure 5.

5. Values
Enter the values shown in range D7..D12 of figure 2. Be sure to follow each of these with a percent sign. Enter the values shown in range B51..G51 of figure 4.

6. Range names

Name	***Range***
table	A7..E12
scrap	B64
accept	C64

Cell	***Formula***
E7	1–D7

For example, to assign the name *table*, press / (*Symph*·MENU), select Range Name Create, enter the word *table*, and specify range A7..E12.

7. Formulas
Copy cell E7 to range E8..E12.

B25	@IF(@VLOOKUP($A25,$table,1)= B$24,@VLOOKUP($A25,$table,3), @IF(@VLOOKUP($A25,$table,2)= B$24, @VLOOKUP($A25,$table,4),0))

Copy cell B25 to range B25..I30.

B34	@IF($A34=B$33,1,–B25)

Copy cell B34 to range B34..G39.

B53	+B44*B51

Copy cell B53 to range C53..G53.

C55	@SUM(B51..D51)
C57	@SUM(B53..G53)
E71	+scrap
E73	+accept

8. Save the file
To save the template with its formulas intact, select /File Save (*Symph:* SERVICES File Save), type a file name that isn't already listed in the default directory, and press Return.

PC Magazine says, "Northgate™'s SlimLine 320 ...

- **Smallest full power 386™ system ever**
- **386/20 Microprocessor**
- **No larger than a typewriter**
- **1Mb Ram**
- **40Mb Hard Drive**
- **1.2 and 1.44 Floppy Drives**
- **12″ High Resolution Monochrome Monitor**
- **16 Bit VGA Built-in**
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PC Magazine said: "(SlimLine) doesn't take up a lot of room...but it delivers plenty of computer for a price you might expect to pay for a 286 system."

The heart of the system is a new Northgate proprietary motherboard with built-in hard and floppy disk controllers, 2 serial and 1 parallel port and 16-bit VGA video. Smaller than a sheet of legal paper. It gives you a host of features that are add-ons in others' systems. Even our clock/calendar method is rated for 5 years without using old-fashioned batteries. And with five expansion slots, you have plenty of room for all your peripherals.

Use it at office or home. Run the latest multi-tasking applications under Microsoft Windows™ or Northgate's OS/2® Crunch numbers on the biggest spread sheets. Sort, search and select data in your databases at the blink of an eye. And if you're looking for high performance terminals in a network environment, SlimLine 320 is an ideal solution.

When it's this good, this cheap, why buy less?"*

December 26, 1989

And remember... your Northgate SlimLine 320 is backed by expert technical support any time you need it. Call toll-free, 7 days a week, 24 hours a day. On-site deskside service is available 5 days a week (to most locations).

SYSTEM FEATURES

- Intel® 20 MHz 80386 microprocessor
- 1Mb 32-Bit DRAM on motherboard (expandable to 8Mb)
- 40Mb 28 ms hard drive
- 80387 math coprocessor support
- Two high density diskette drives: 5.25″ 1.2Mb and 3.5″ 1.44Mb
- Five open expansion slots
- One parallel and two serial ports
- 12″ high-resolution monochrome monitor
- Built-in 16-Bit VGA adaptor, 800 × 600 resolution
- Exclusive award-winning *OmniKey*/PLUS keyboard
- MS-DOS 4.01 and GW-BASIC software
- On-line User's Guide to the system and MS-DOS
- Reset and Turbo buttons
- LED Power and Turbo indicators
- FCC Class B Certified

TEST A SLIMLINE 320 AT NO RISK FOR 30 DAYS

Of course, SlimLine 320 comes with a 1-year limited warranty on parts and labor; 5-years on the *OmniKey* keyboard. If a part fails, we'll ship a replacement to you overnight at our expense before you return your part.

Test a SlimLine 320 at no risk for 30 days. If you are not 100% satisfied, return it for a full refund. No questions asked. To place your order, call sales toll-free 24 hours everyday. Be sure to ask about custom configurations, leasing and financing options.

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* *PC Magazine* December 26, 1989 reviewed the Northgate MicroStation 386/20. This system has been upgraded and is now named the "SlimLine 320."

CIRCLE 115 ON READER SERVICE CARD

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We've Pumped Up the Power and Cut the Price!

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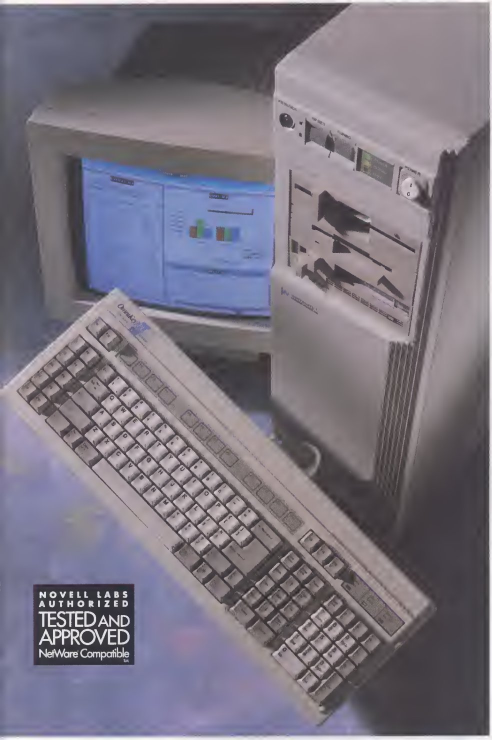

PowerMax 386/33 Standard Configuration

- 33 MHz Intel 80386™ Microprocessor
- Maxtor 200Mb 15MS access hard drive
- 4Mb of 32-bit DRAM on proprietary motherboard (expandable to 16Mb with optional 32-bit memory card)
- 64K SRAM read/write-back cache (optional 256K cache available)
- High density 1.2Mb-5.25″ and 1.44Mb-3.5″ floppy drives. Also reads, writes and formats low density disks
- Eight expansion card slots; one 32-bit, six 16-bit and one 8-bit
- 33 MHz 80387™ or 33 MHz Weitek 3167 numeric co-processor support
- One parallel and two serial ports
- 14″ NEC 3D multisync VGA color monitor with 1024x768 resolution
- 16-bit video controller with 512K memory
- MS-DOS 4.01 and GW-BASIC software
- On-line users guide to system and MS-DOS 4.01
- 220 watt power supply
- Elegance 7 drive-bay custom tower cabinet pictured (desktop style available)
- Microsoft Windows 3.0
- Exclusive *OmniKey*/ULTRA keyboard; award winning PLUS model available
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CIRCLE 116 ON READER SERVICE CARD

Answers to Your Questions about Lotus Products

1-2-3 / Symphony

Why is @NA NA?

Q Can you tell me why the formula @IF(A2=@NA,@NA,A2) in cell A1 returns NA? This happens even when the value in cell A2 isn't NA.

Gus Debats
Irvine, Calif.

A A formula that includes the term NA, which stands for *not available*, returns NA. The expression +A2=@NA returns NA because there is no value to substitute for A2. In your example, *1-2-3* alerts you to the missing value by returning NA for the entire @IF formula.

The @ISNA function tests for the occurrence of NA. It returns 1 if a specific cell or expression contains NA, and it returns 0 if the cell or expression does not. For example, the formula @IF(@ISNA(A2),@NA,A2) in cell A1 returns NA if cell A2 contains NA. Otherwise, it returns the value of cell A2.

You don't need to use an @IF formula. Your @IF function means "If cell A2 is NA, then return NA; otherwise, return the value that appears in cell A2." Simply enter *+A2* into cell A1.

Escape-proof macro menus

Q Most of my macros include several levels of menus to help users who may not be familiar with spreadsheet commands. However, I have a problem with menu macros in every release of *1-2-3*.

According to the reference manuals, you can back out of the current menu to the previous menu by pressing the Escape key. But in every menu I've created, pressing Escape stops the macro and returns the worksheet to Ready mode.

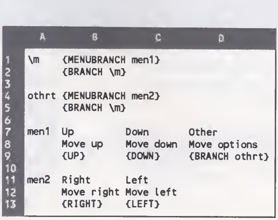
Am I missing something? I'd like to prevent users from disrupting my menus.

Henry E. Wells
Greenleaf Health Systems Inc.
Chattanooga, Tenn.

A Constructing menu trees within macros is easy when you understand how the {MENUBRANCH}, {MENUCALL}, and /XM commands work. The following discussion focuses on the {MENUBRANCH} command but applies to all three.

When the macro processor encounters a {MENUBRANCH} command, macro control remains at that command. For example, the command {MENUBRANCH men1} doesn't mean "Branch to the menu named *men1*." Rather, it means "Display a menu whose instructions start in *men1*." The menu appears in the control panel so that you can make a selection.

Macro control branches only when you make a selection. If you select the first item in the menu, control branches from the {MENUBRANCH} command to the macro command below the corresponding item in the menu instructions. If you press Escape in response to the displayed menu, macro control passes from the {MENUBRANCH} command to the command directly below it. If the cell below the {MENUBRANCH} command is blank, the macro stops when you press Escape.



```
      A      B              C            D
 1   \m     {MENUBRANCH men1}
 2          {BRANCH \m}
 3
 4   othrt  {MENUBRANCH men2}
 5          {BRANCH \m}
 6
 7   men1   Up          Down         Other
 8          Move up     Move down    Move options
 9          {UP}        {DOWN}       {BRANCH othrt}
10
11   men2   Right       Left
12          Move right  Move left
13          {RIGHT}     {LEFT}
```

Enter the labels shown in the figure below. Begin the entry in cell A1 with an apostrophe label prefix. Use the Range Name Labels Right command to assign the labels in range A1..A11 as range names for the adjacent cells in column B.

Hold down the MACRO key (Alt on most computers) and press M. The command {MENUBRANCH men1} causes *1-2-3* and *Symphony* to display in the control panel the menu whose instructions start in cell B7.

If you select Other from the menu, macro control branches from the {MENUBRANCH} command in cell B1 to the command in cell D9, which is a {BRANCH} statement that sends macro control to the cell named *othrt*. There the macro processor encounters a second {MENUBRANCH} command and displays the menu whose instructions start in cell B11.

If you press Escape in response to this second menu, macro control passes from the {MENUBRANCH} command in cell B4 to the {BRANCH} command in cell B5. The macro restarts and the first-level menu reappears in the control panel. Thus, pressing Escape takes you back to the previous level of the menu tree.

We included the command {BRANCH \m} after the first {MENUBRANCH} command to disable the Escape key for the first-level menu. If someone presses Escape in response to the first-level menu, the macro starts again and the menu reappears in the control panel.

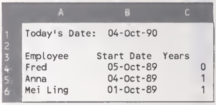
When you create menus, always follow a {MENUBRANCH} command with a {BRANCH} command. The {BRANCH} command should direct macro control to the {MENUBRANCH} command that displayed the previous menu.

Same date next year

Q I need a formula to determine length of employment in years. For example, if an employee's start date is October 5, 1989, and the current date is October 4, 1990, the formula should return 0. On October 5, 1990, the employee has completed one year and the formula should return 1. Can you help?

Joseph J. Martella II
Brooklyn, N.Y.

A Our solution is a single formula that uses several @DATE functions and an @IF function to determine how many full years there are between the employee's start date and the current date. To follow the discussion, enter the labels in column A and row 3 of the following figure. Use the @DATE function to enter the dates in cell B1 and range B4..B6. Note that if you want to use the current date in your calculations, enter @INT(@NOW) into cell B1. Assign the Date 1 format to cell B1 and range B4..B6, and set the width of column B to 12. Finally, assign the name *curdate* to cell B1.



	A	B	C
1	Today's Date:	04-Oct-90	
2			
3	Employee	Start Date	Years
4	Fred	05-Oct-89	0
5	Anna	04-Oct-89	1
6	Mei Ling	01-Oct-89	1

Enter the following formula into cell C4 and copy it to range C5..C6:

```
@YEAR($curdate)-@YEAR(B4)-
  @IF(@MONTH(B4)>@MONTH($curdate),1,
  (@MONTH(B4)=@MONTH($curdate))*
  @DAY(B4)>@DAY($curdate))
```

The first expression, @YEAR($curdate)–@YEAR(B4), subtracts the year of the employee's start date from the year of the current date. For example, in 1990 this expression returns 1 for any 1989 start date.

The second expression tests whether the month number of the start date is greater than the month number of the current date:

```
@IF(@MONTH(B4)>@MONTH($curdate),1,
  (@MONTH(B4)=@MONTH($curdate))*
  @DAY(B4)>@DAY($curdate))
```

If it is, the formula returns 1. In other words, the @IF formula returns 1 if the employee started working during a month that occurs

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CIRCLE 117 ON READER SERVICE CARD

later in the year than the current month. If not, the @IF formula evaluates the following expression:

```
(@MONTH(B4)=@MONTH($curdate))*
  @DAY(B4)>@DAY($curdate)
```

This expression returns 1 if the month number of the current date is the same as the month number of the start date and if the day number of the start date is greater than the day number of the current date. So if the employee started working during the same month of the year as the current month and on a day that is later in the month than the current day, this expression returns 1. If neither or only one of these conditions is true, the expression returns Ø.

The second expression is subtracted from the first expression to obtain the length of employment in years.

Suppose the employee's start date is October 4, 1989, and today's date is October 5, 1990. The first expression returns 1 because the difference in years is 1. The second expression also returns 1 because the employee began working during the same month as the current month and on a day that occurs later in the month than the current day. The second expression is subtracted from the first expression and the formula returns Ø.

Revisited

Numbers, not blanks

In the September 1989 issue, page 95, Abdul Nasser asked if the @ISNUMBER function could be modified to return 1 only when it refers to a cell that contains a number. The function returns 1 when the cell it refers to contains a number or when the cell is blank. You provided the following formula:

```
@ISNUMBER(A1)*(@CELL("type",
  A1..A1)="v")
```

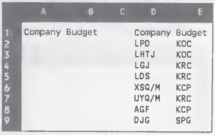
The second part of your formula, @CELL("type",A1..A1)="v", is all that you need to enter. It returns 1 if there is a value or a formula in cell A1. It returns Ø if cell A1 contains a label or is blank.

Martin Cowan
New York, N. Y.

The editor replies: Thanks for the suggestion. There is one major difference between the two formulas, however. Our formula evaluates to 1 if cell A1 contains a formula that returns a value. It evaluates to Ø if cell A1 contains a formula that returns a label. Your formula evaluates to 1 if cell A1 contains any formula, even if the formula returns a label.

If column A, then column B

I'd like to offer another solution to the problem posed by H. Allan Caldwell in the June issue (page 89). He wanted to match company-identification codes with budget codes. The table of codes is located in range D1..E9 of the following figure.



	A	B	C	D	E
1	Company	Budget		Company	Budget
2				LPD	KOC
3				LHTJ	KOC
4				LGJ	KRC
5				LDS	KRC
6				XSQ/M	KCP
7				UYQ/M	KRC
8				AGF	KCP
9				DJG	SPG

Your method uses the @VLOOKUP function in column B. When you enter a company code in column A, the formula in column B returns the corresponding budget code.

Another method is to use the Range Name Labels Right command to assign the labels in range D2..D9 as range names for the adjacent cells in column E. Then enter the desired company codes in column A. Finally, enter the formula @@(A2) in cell B2 and copy it down the column as needed. The formula @@(A2) returns the entry in the cell specified by the range name in cell A2. For example, if cell A2 contains *LHTJ*, the formula in cell B2 returns *KOC*.

Kevin Patterson
Springfield, Mo.

A Thanks for sharing this solution. Note that if you enter a company code that isn't in the table, the formula in column B returns ERR.

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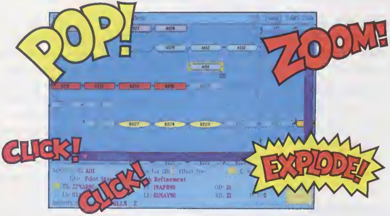
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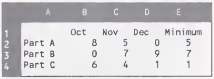
Contest

This month we ask users of *1-2-3* and *Symphony* to submit the best method that returns the minimum value from a row of values, excluding 0 as a valid minimum. The row of values can range from 0 to 10. Consider the following worksheet:



	A	B	C	D	E
1		Oct	Nov	Dec	Minimum
2	Part A	8	5	0	5
3	Part B	0	7	9	7
4	Part C	6	4	1	1

Although row 2 contains a zero in the *Dec* column, the formula in the *Minimum* column should return 5. Likewise, the formula in the *Minimum* column of row 3 should return 7.

This idea was submitted by Nelson Jarvis of Columbia, S.C..

The first 25 people who submit what the *LOTUS* judges consider the best answer will receive a *LOTUS* Swiss Army knife.

Please send a disk copy and a printed copy of your answer with appropriate documentation. All entries must be postmarked before midnight, October 31, 1990. Winners will be announced in the January 1991 issue. Send your answers to **October Contest**, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

Submit contest ideas to Q&A Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Include your solution, documented with appropriate comments. We'll pay $200 if we use your contest idea accompanied by a proven solution, $25 if we use your idea unaccompanied by a solution.

This material was prepared by Daniel Gasteiger and the Technical Editors.

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LOTUS The questions and answers that contain screens are available on disk. See page 16 for details.

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GOOD IDEAS

More Tips on Using Lotus Products

1-2-3 / Symphony

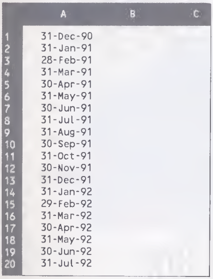
Counting the days

As an accountant, I often need to calculate a list of dates. I use the following technique to calculate the last day of the month.

Determine the month you want to start with and enter the date of the last day of that month. In this example, enter the formula @DATE(90,12,31) in cell A1.

Next enter the following formula in cell A2 and copy it down the column as needed.

```
@DATE(@YEAR(A1+45),
  @MONTH(A1+45),1)-1
```



	A	B	C
1	31-Dec-90		
2	31-Jan-91		
3	28-Feb-91		
4	31-Mar-91		
5	30-Apr-91		
6	31-May-91		
7	30-Jun-91		
8	31-Jul-91		
9	31-Aug-91		
10	30-Sep-91		
11	31-Oct-91		
12	30-Nov-91		
13	31-Dec-91		
14	31-Jan-92		
15	29-Feb-92		
16	31-Mar-92		
17	30-Apr-92		
18	31-May-92		
19	30-Jun-92		
20	31-Jul-92		

Format column A as Date 1 and increase the column width if column A displays asterisks. The formula in cell A2 calculates the following month's ending date first by adding 45 to both the year and month number in cell A1 (December 31, 1990). Using the resulting year and month numbers, and 1 as the day number, the formula evaluates to the first of February. The formula then subtracts 1, which returns the last day of January.

James E. Burrows, CPA
Sterling, Mass.

Create @function index file

The Lotus help screens show the correct syntax for @functions and macro commands. But as soon as the help screen is cleared, I forget the exact order of the parameters. Instead of writing the syntax down and typing it in moments later, I created files containing @functions and macro commands. I then use the File Combine command to combine them into my current worksheet.

Create a two-column worksheet that lists the @function names in column A and the @function syntax in column B. Assign the names in column A as range names for column B by selecting /Range Name Labels Right and specifying the list of labels in column A. Create another file listing the macro commands and their syntax, and assign the range names the same way.

Below are excerpts from my two files.

@ Functions	
DATE	@DATE(*yr,mo,day*)
FIND	@FIND(*search-string, string,start#*)
IF	@IF(*test,true,false*)

Macro Key Word	
BEEP	{BEEP *tone-number*}
BLANK	{BLANK *location*}
GETLABEL	{GETLABEL *prompt,location*}

To incorporate the @DATE function into the current worksheet, position the cell pointer in the cell in which you want to contain the item, select /File Combine Copy Named/Specified-Range, enter *date*, then specify the name of the file that contains the @function listing. The label *@DATE(yr,mo,day)* will appear in the current worksheet at the cell-pointer location. Press the EDIT key, then the Home key. Remove the label prefix and replace the existing parameters with the real values.

Diane Bumpass
Home Beneficial Life Insurance Co.
Richmond, Va.

In *Symphony* assign the range names by selecting MENU Range Name Labels Right. To combine an @function into the worksheet, select SERVICES File Combine Copy Named-Area, enter the range name, select Ignore Formulas, and specify the name of the file that contains the @function list.

In *1-2-3* Release 3 if you enter the first part of the @function or macro key word—for example, *@DATE(* —and then press the HELP key, the help screen for that @function or macro key word appears. As you build your formula, you can use the Escape key to toggle between the worksheet and the help screen. For more on HELP, see "911 for *1-2-3*," June, page 96.

1-2-3

Salvage data with File Combine

If you accidentally erase data while working in *1-2-3*, you may be able to use the File Combine command to retrieve the lost data instead of having to retrieve the entire file.

First, move the cell pointer to the top-left corner cell, where you want the data to appear. Select /File Combine Copy Named/Specified-Range, enter the cell address of the cell or range you want to replace, and enter the name of your current file.

This technique will work only if you have previously saved the file, and you may end up with some outdated data. But it's worth a try if you have made a lot of revisions to the current file.

Cathy Niespodzany
Wisconsin Public Service
Green Bay, Wis.

1-2-3 Releases 2.2 and 3 contain an undo feature. If erasing the data was the last thing you did, you can undo it. Press the UNDO key combination (ALT-F4) to cancel any changes made to your worksheet since *1-2-3* was last in Ready mode.

In Release 2.2 the default for UNDO is enabled when you load the program. If you want to disable UNDO, select /Worksheet Global Default Other Undo Disable. UNDO is by default disabled when you load Release 3. Select /Worksheet Global Default Other Undo Enable to enable UNDO. In addition, select Update Quit to make UNDO automatically enable every time you load Release 3.

Print with 2.01 drivers in 2.2

If you upgraded from *1-2-3* Release 2.01 to Release 2.2, you may have noticed that some printer drivers available in Release 2.01 aren't available in Release 2.2. Because several drivers were added to Release 2.2, some device drivers had to be omitted in order for the file to fit onto a 360K, 5¼-inch disk. Both releases are designed to load from either a floppy or a hard disk.

Even if you have upgraded to Release 2.2, you can still use the drivers available in Release 2.01. Create a driver set in the Release 2.01 Install program. Include the device that is unavailable in Release 2.2 and give the driver set a unique name (something other than the 123.SET default file name). Copy the SET file to your Release 2.2 program subdirectory. To load Release 2.2 with your SET file, enter *123 drivername*, where *drivername* is the name of the Release 2.01 SET file.

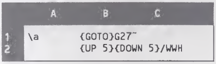
Amy Hummel
Customer Support Dept.
Lotus Development Corp.

Open windows with a macro

If you write a macro in *1-2-3* that uses the {GOTO} command to send the cell pointer to a specific cell and then sets a horizontal window, *1-2-3* might not be able to create the window. Depending on the location of the cell pointer when you invoke the macro and where the {GOTO} command sends it, the cell pointer may end up in the upper-left cell of the display. There must be at least one row above the cell pointer in order for the Worksheet Window Horizontal command to work.

You can include {UP} and {DOWN} commands after the {GOTO} command to position the screen so that there is at least one row above the cell pointer. For example, the following macro creates a top window that is five rows deep.

To create the macro, enter the labels shown in range A1..B2. Use the Range Name Labels Right command to assign the label in cell A1 as the range name for cell B1.



	A	B	C
1	\a	{GOTO}G27~	
2		{UP 5}{DOWN 5}/WWH	

To run the macro, hold down the Alt key and press A. To adjust the depth of the windows, you may have to experiment with the numbers you use in the {UP} and {DOWN} commands. The argument for {UP} depends on the row number the {GOTO} command sends the cell pointer. The argument for {DOWN} cannot be greater than 18.

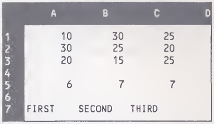
Maria Martens
Customer Support Dept
Lotus Development Corp.

To set a vertical window, change the macro code in cell B2 to {RIGHT 5}/WWV. To adjust the width of the vertical windows, change the number within the {RIGHT} command. Note that if you use 7 or higher, the right window will be one column wide.

Labels over stacked bars

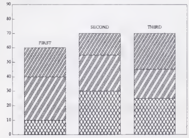
When you assign data labels to a range in a stacked-bar graph, *1-2-3* Release 3 places the data labels inside the corresponding portion of each stacked bar. The program ignores the placement option you specify. If the graph has fewer than six ranges, however, you can use the F range to center a data label over each stacked bar.

To do this, create an F range containing numbers that are one-tenth the sum of the values of each stacked bar. For example, if the sum of the values graphed in the first stacked bar is 60, use 6 as the first value for the F range, as shown in the following figure.



	A	B	C	D
1	10	30	25	
2	30	25	20	
3	20	15	25	
4				
5	6	7	7	
6				
7	FIRST	SECOND	THIRD	

To create the graph, enter the values in range A1..C3 and the labels in range A7..C7 of the figure. Enter the formula @SUM(A1..A3)/10 in cell A5 and copy it to range B5..C5. Select /Graph Type Stack-Bar A, specify range A1..C1, select B, specify range A2..C2, select C, specify range A3..C3, select F, and specify range A5..C5. Next, select Options Data-Labels F, specify range A7..C7, and select any placement option. If you're using a color monitor, select Quit Advanced Colors F Hide Quit Quit Quit View. If you're using a monochrome monitor, select Quit Advanced Hatches F 8 Quit Quit Quit View.



This technique produces a graph with labels, as shown in the figure. To increase the distance between the stacked bar and the label, increase the values in the F range. Decrease the values in the F range if you want to position the labels closer to the stacked bar.

Mary-Anne Schubert
Customer Support Dept.
Lotus Development Corp.

This material was prepared by the Technical Editors, with the help of the Lotus Customer Support staff.

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The good ideas that contain screens are available on disk. See page 16 for details.

HELP/3 ••• ▬▬▬ •••

Release 3 Treasure Hunt: Part 2

Delve deeper into the hidden features of *1-2-3* Releases 3 and 3.1.

BY DAVID J. BOOKBINDER

Whether you've used Release 3.*x* for a while or are just now making the upgrade, you may have overlooked the new features described below. These humble tools can be as valuable as such highly touted innovations as 3-D worksheets.

In August we presented a first helping of little-known features of *1-2-3* Release 3. This month we'll explore commands that help you simplify date and time entry, set the widths of several columns at once, annotate cells and ranges, and see the big picture of your worksheet's organization. We'll also see how to record keystrokes, use longer macro names, and put a muzzle on the computer's beep. All these techniques, including the ones described in Part 1, work in the new *1-2-3* Release 3.1, as well as in Release 3.

The Easy Way to Make a Date

In the past, you had to use an @DATE or @DATEVALUE formula to enter a date in the worksheet. These @functions return a serial number that represents the date.

Release 3.*x* makes date and time entry much simpler by sidestepping the @functions. You just enter the date or time into a cell, using any of several *1-2-3* date and time formats, and the cell stores the appropriate serial number.

For example, if you enter *5/7/87* into a cell, *1-2-3* interprets it as the serial number 31904, because May 7, 1987, is the 31,904th day of this century. Other releases of *1-2-3* treat 5/7/87 as a formula (5 ÷ 7 ÷ 87) that yields the value 0.008210.

If you have already assigned a date or time format to the cell, the date you enter will be displayed in that format rather than as a date serial number. For example, Date 1 format (DD-MMM-YY) displays the date as 07-May-87. If you see a series of asterisks instead of a date, expand the column until it's wide enough to display the data in the chosen format.

If you use Release 3.*x*'s Range Format Other Automatic command, which we introduced in Part 1, the cells assume the date format of the data you input. For example, if you assign the Automatic format to a cell and enter *5/7/87*, the cell retains the value 31904 and its format changes to Date 4 format (Long Intn'l), which by default is the MM/DD/YY format. Any data you subsequently enter into the cell retains that format until you reformat the cell via the Range Format commands. Remember that the Automatic format feature works not only with dates and times but also with labels and numeric formats such as Fixed, Currency, Percent, and Comma.

Two of *1-2-3*'s date formats cannot be used to enter dates. If you try to enter a date in Date 3 or Date 5 format, Release 3.*x* will not interpret your input as a date. Data entered in these formats do not yield the correct serial value, nor do they convert a cell that is set to Automatic format to the corresponding date format. Date 3 format displays dates in the MMM-YY form—for example, May-87. By default Date 5 format, the Short Intn'l format, displays dates in the MM/DD form—for example, 05/07. To see the full selection of date and time options, call up the *1-2-3* Range Format menu.

Release 3.*x* lets you input time values in any of the four time formats. For example, to display 10:00 PM in cell B10, select /Range Format Date Time 2 or /Range Format Other Automatic and specify cell B10. Then enter *10:00 PM* in cell B10. *1-2-3* stores the entry as the value .916666 but displays it as 10:00 PM. You can enter a time value in either 12- or 24-hour format. You can enter the AM/PM designation without the preceding space and, if you prefer, in lowercase.

Another new wrinkle is the ability to enter a series of dates or times via the Data Fill command. For example, suppose you want to display the months of the year in MMM-YY format in range B1..B12, beginning with January 1991. First select /Range Format Date 3 or /Range Format Other Automatic and specify range B1..B12. Then select /Data Fill and specify range B1..B12 as the Fill range. Enter *Jan-91* as the start value; enter *1m*, which stands for one month, as the step value; and enter a date at least as large as the last date in the series—in this case, *Dec-91*—as the stop value. *1-2-3* fills the range with date values for Jan-91, Feb-91, and so on.

A similar process generates a series of time values. To fill range C1..C9 with values for 9:00 AM to 5:00 PM, assign the Automatic or Date Time 2 format to range C1..C9. Select /Data Fill and specify range C1..C9 as the Fill range. Enter *9:00 AM* as the start value; enter *1h*, which stands for one hour, as the step value; and enter a value slightly larger than the last value in the series—in this case, *5:01 PM*—as the stop value. *1-2-3* enters the hourly time values for 9:00 AM to 5:00 PM.

Wide-Range Widening

Now you can quickly assign a width to a range of columns, not just a single column. Select /Worksheet Column Column-Range Set-Width. *1-2-3* prompts you to specify a range of contiguous columns. This range can be in a single worksheet, or it can extend through a stack of worksheets in the same file. Finally, specify the desired column width.

FYI

If you've been away from a worksheet for a while, you may not remember how a specific formula works or what data a particular range name represents.

Using Release 3.*x*'s annotation features, however, you can write and store notes that jog your memory.

To annotate a formula or value, add a semicolon to the end of the formula or value, type the note, and press Return. Each cell in a Release 3.*x* worksheet can contain up to 512 characters, so there's plenty of room for a note. When the cell pointer is in an annotated cell, *1-2-3* displays the note, along with the cell's contents, in the control panel.

To annotate an existing range name, select /Range Name Note Create. *1-2-3* displays a list of the named ranges in the current file. Move the pointer to the name you want to annotate and press Return. Enter the note and select Quit.

You can display the note for a range name or create a table of all the named ranges in the current file along with their notes. To display the note for a particular range name, select /Range Name Note Create and specify the range name. *1-2-3* displays the note on the command line. After reading the note, press Return and select Quit. To create a table of range names and their respective notes, move the cell pointer to a blank area of the worksheet, select /Range Name Note Table, press Return, and select Quit. *1-2-3* creates a three-column table that displays the range name, range address, and note, if any.

To prevent the note table from overwriting cells that contain data, make sure there's ample blank space to the right of and below the cell you specify. If you use Release 3.*x*'s 3-D features, you can even store the note table in a separate worksheet. In fact, you might want to create the note table once and assign a range name such as *namenotes* to the upper left-hand corner cell of the table. Then, in order to update the table, select /Range Name Note Table and enter *namenotes*. *1-2-3* replaces the old note table with the new one.

A Bird's Eye View

When you're working on a large worksheet, it's easy to lose perspective. With the Worksheet Window Map command, you can see a chart that shows the type of contents in each cell.

To create the map, *1-2-3* temporarily makes each column two characters wide and displays a quotation mark (") in each cell that contains a label, a pound sign (#) in each cell that contains a value, and a plus sign (+) in each cell that contains a formula or an annotated value.

The map is a useful worksheet-debugging tool. You can quickly see, for example, whether a cell in a range that should contain only formulas contains a value or a label. To display the map, select /Worksheet Window Map Enable. After viewing the map, press Return and *1-2-3* resumes normal worksheet display.

Curiously, the Worksheet Window Map Disable command serves no purpose whatsoever in Release 3.*x*. You can't execute it when the Map is displayed because you must clear the map by pressing Return or Escape before you can access the *1-2-3* menus.

Automatic Keystroke and Command Recording

During each work session, Release 3.*x* stores your keystrokes in a 512-byte area of memory known as the record buffer. This buffer always contains the most recent keystrokes. As the buffer fills up, the oldest characters are pushed out to make room for new ones.

To manipulate the contents of the record buffer, press the RECORD key (Alt-F2). *1-2-3* displays a menu with four choices: Playback, Copy, Erase, and Step. To repeat the stored series of commands or keystrokes, select Playback.

To copy part of the record buffer to the worksheet, select Copy. You can assign a range name to the keystrokes, making them into a macro. Before performing a task that you want to repeat, select Erase to clear the record buffer. Then the only keystrokes in the buffer will be those for the task you want to repeat.

Choose Step if you want to run a macro one operation at a time. Other versions of *1-2-3* designate Alt-F2 as the STEP key. In Release 3.*x*, Step is one of the menu options that are presented when you press this key, which is now known as the RECORD key.

When you select Playback or Copy, *1-2-3* displays the contents of the record buffer and prompts you to highlight the keystrokes you want to play back or copy to the worksheet. To highlight keystrokes, move the cursor to the first character you want to play back or copy, press the Tab key to anchor the cursor, then press the RightArrow or LeftArrow key to highlight the keystrokes. Finally, press Return to accept the highlighted selection.

If you choose the Playback command, *1-2-3* repeats the recorded keystrokes. If you select Copy, *1-2-3* prompts you to specify a worksheet range to hold the copied keystrokes.

Release 3.*x* records keystrokes in macro format. The initial letter of a menu command represents the command—for example, C represents the Copy command. A tilde (~) represents the Return key. To conserve space in the buffer, *1-2-3* abbreviates macro key names and uses repetition counts for multiple presses of the same key. For example, {LEFT} is stored as {L}, and three consecutive presses of the Left-Arrow key are stored as {L3}. The buffer does not record depressions of the COMPOSE (Alt-F1), RECORD (Alt-F2), RUN (Alt-F3), UNDO (Alt-F4), Shift, Break, CapsLock, NumberLock, and ScrollLock keys.

Expanded Macro Names

Although you can still name a macro by using a backslash-and-letter combination, you can also use any valid range name to name a macro. To invoke a macro that's stored in a named range, press the RUN key (Alt-F3). *1-2-3* displays a list of range names. Highlight the name of the macro you want to run and press Return. *1-2-3* runs the macro. As an alternative, you can use the contents of any range as a macro, even if it does not have a name, by pointing to it and pressing the RUN key.

Beep No More

You can turn the computer beep on or off while you work in *1-2-3*. Initially, the beep is on, and *1-2-3* beeps when you make an error or try to move the cell pointer beyond the edge of the current worksheet. If you prefer a quiet session, turn the beep off. Select /Worksheet Global Default Other Beep No. To save this setting in the *1-2-3* configuration file, select Update Quit. Otherwise, select Quit and only the current session will be beepless.

David J. Bookbinder is a free-lance writer and author of *The Lotus Guide to 1-2-3 Release 3*.

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REVIEWS ✓ ✓ ✓

Three to Go

Notebook PCs from Compaq, Toshiba, and Sharp offer 80286 power, but the Sharp does it best.

BY JON PEPPER

Compaq's LTE/286 (top left) is the only notebook PC with a 40-megabyte hard-disk option. The Toshiba T1200XE's (above) CGA display is large and bright. At less than 1½ inches high, the Sharp PC-6220 (left) is the slimmest of the three.

If you think using a lightweight notebook computer means trading power and utility to save a few pounds, it's time to reexamine your assumptions. In the two years since NEC Technologies released the UltraLite, notebook computers have acquired more storage, better keyboards, longer battery life, and AT-class processors.

Three recently introduced notebook PCs, the Compaq LTE/286, the Toshiba T1200XE, and the Sharp PC-6220, provide 80286-class CPUs, hard-disk storage systems, and more than enough overall power and battery life to run your *1-2-3* worksheets comfortably in just about any situation. The three systems show not only how far this class of lightweight portables has advanced but how quickly it's moving.

We ran the three computers through a variety of performance tests and compared important features. Compaq Computer Corp.'s LTE/286 was one of the first notebook PCs to offer hard-disk storage, packing 20 or 40 megabytes in its 6.7-pound frame. It is a solidly made, reliable machine, but it is hampered by a poor keyboard layout and a screen display that doesn't stand up to the competition.

Toshiba America Information Systems aimed its T1200XE squarely at the Compaq and surpassed it in almost every area. The Toshiba weighs almost 1½ pounds more than the Compaq, and with Compaq's latest round of price reductions, it costs about $500 more. However, it has a slightly larger, brighter screen, a better keyboard, and a faster recharge time on its removable battery.

While performance for all three was about equal, we rate the newest contender, the Sharp PC-6220, as the best value. At 4 pounds (including battery) it's even lighter than the NEC UltraLite, yet it delivers a high-quality, VGA-compatible display that's larger than the CGA-based Toshiba and Compaq displays. (Note: At press time, three challengers to the Sharp—from Airis Computer Corp., Grid Systems Corp., and NEC—had just been or were about to be announced. We plan to review those machines in an upcoming issue.)

COMPAQ LTE/286

The Compaq LTE/286 quickly became the benchmark for notebook computers with hard disks when it was introduced last year. The Compaq is just 8½ by 11 inches with a full complement of I/O ports, a floppy-disk drive, and a hard disk. The Compaq performed a bit faster than the other two systems on one of our two worksheet-recalculation tests, but otherwise CPU-based performance was equivalent to the other notebooks.

The Compaq's high points are its quality construction, good documentation, and the fact that it alone offers a 40-megabyte hard-disk option. Its low points include a small screen display and generally poor image quality. The 640-by-200-pixel CGA screen displays the standard 80 characters by 25 lines but in only 4 by 8 inches. We often had to strain to make out cells in a large worksheet. Despite contrast and brightness controls, this is not a screen you want to stare at for several hours.

While the Compaq had the largest hard disk of the test group, it also had the poorest average disk-access time: 34 milliseconds versus 24ms for the Toshiba and 23ms for the Sharp. The keyboard layout is particularly annoying. Compaq arranged the cursor keys in an inverted L at the right side of the keypad, which resulted in our constantly pressing the wrong cursor key.

The Compaq turned in the longest battery life in our tests–6 hours and 17 minutes (see table). If battery life is a major criterion, the LTE deserves extra consideration. On the other hand, the Compaq batteries also took eight hours to recharge, the longest time of the three. Other minor liabilities: The Compaq comes standard with only 640K of RAM instead of 1 megabyte, and the base price doesn't include DOS. The Compaq LTE/286 may be fairly new, but it is already showing signs of technological lag, compared with the rest of the field.

TOSHIBA T1200XE

Presumably using the Compaq as a starting point, Toshiba has succeeded in producing a generally superior machine. The standard keyboard is easy to use and has a nicer typing feel than the Compaq. Like the Compaq, the T1200XE also supports a CGA display, but it uses double-scan technology to provide 640-by-400-pixel resolution. The display is somewhat larger and a bit brighter than the Compaq. And unlike the Compaq, it provides a true aspect ratio (the relationship of height to width), so you don't end up with squashed pie charts. In short, the Toshiba display is a better choice for extended work sessions.

The Toshiba's performance was close to the Compaq in all but one of our tests, and its 20-megabyte hard drive was faster in our access-time benchmark. Warts: The Toshiba weighs almost 1½ pounds more than the Compaq and its battery life was more than two hours shorter in our tests (although it recharged in half the time it took the Compaq). Also, you can't add a math coprocessor to the Toshiba as you can with the Compaq and the Sharp. But for many users, these are all minor points. Basically, the T1200XE can do everything the LTE/286 can do and with a better keyboard and screen.

SHARP PC-6220

Sharp Electronics Corp.'s PC-6220 has clear advantages in the areas of weight and display quality. It weighs about half as much as the Toshiba, and with a height

THE THREE GO HEAD TO HEAD

Our tests were designed to cover the most critical aspects of a notebook PC: CPU performance, hard-disk performance, and battery operation. The first three tests, based on *1-2-3* worksheets, consist of two loan recalculations and one database sort. We used *Power Meter*, a system-diagnostic utility from The Database Group in Upland, Calif., for the video, the aggregate system, and the MIPS tests. The video test measures the overall throughput of the video subsystem; the aggregate system test measures efficiency over a range of word-processing, spreadsheet, and database tasks. For both tests, the higher the number, the better. The MIPS result tells how many millions of instructions per second the computer can process. Hard-disk access time is measured on a test developed by Core International, a hard-disk manufacturer in Boca Raton, Fla. For the Compaq and Sharp PCs, results differ slightly from the manufacturers' claims. The battery tests were developed by us for this evaluation. All three machines turned in better battery-life performances than their manufacturers claim.

BENCHMARKS

	Compaq	Toshiba	Sharp
1-2-3 Recalc 1 (min.:sec.)	0:39	0:39	0:39
1-2-3 Recalc 2 (min.:sec.)	1:12	1:43	1:18
1-2-3 Sort (min.:sec.)	0:42	0:42	0:42
Video test	740.23	1357.55	1296.87
Aggregate system test	58.19	69.71	66.58
MIPS	1.882	1.884	1.895
Hard-disk access (ms.)	34	24	22.4
Battery life (hours:min.)	6:17	4:00	2:20
Recharge time (hours:min.)	8:00	3:00	3:00

FEATURES

	Compaq	Toshiba	Sharp
CPU	80C286	80C286	80C286
Clock speed	12/8 MHz	12/6 MHz	12 MHz
Hard disk	20MB*	20MB	20MB
Display type	CGA (640x200)	CGA (640x400)	VGA (640x480)
RAM standard	640K	1MB	1MB
RAM maximum	2.6MB	5MB	3MB
Internal slot	1	1	1
Keyboard	80 keys	82 keys	79 keys
Carry handle	No	Yes	No
Optional coprocessor	Yes	No	Yes
Screen size	4" x 8"	4 7/8" x 7 3/4"	6" x 8"
List price	$3,499**	$3,999	$3,995
Weight	6.7 lbs.	8.1 lbs.	4 lbs.

* 40MB hard disk optional

** $3,999 with 40MB hard disk

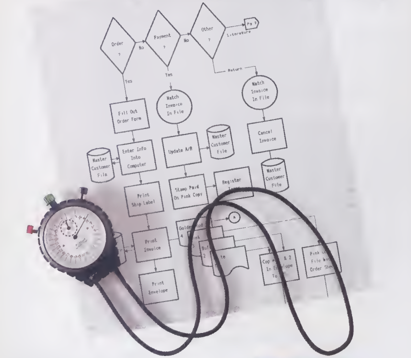
of less than 1½ inches, it is easily the slimmest. The PC-6220 also offers a VGA-compatible, paper-white display based on Sharp's triple supertwist LCD technology. With its large 10-inch diagonal screen and 16 shades of gray, the Sharp display handles detailed graphics and on-screen presentations with aplomb.

There are only two minor wrinkles in the Sharp's design: It lacks both an internal floppy-disk drive and a standard-size parallel (printer) port. Instead of a floppy drive, Sharp supplies a cable and Traveling Software's *LapLink* file-transfer program in ROM (along with DOS 4.01). You may also purchase Sharp's optional external floppy drive, which weighs just over a pound and plugs directly into an expansion port at the back of the machine. To keep the PC-6220's profile down, Sharp uses a proprietary mini port instead of a standard printer port. However, the unit comes with a small adapter that you can attach with thumbscrews to connect a parallel printer.

A more serious complaint can be leveled at the Sharp's battery performance, which at just under 2½ hours was the poorest of the three. For those who must have longer battery life, Sharp offers an external battery pack rated at five hours, which brings the weight of the unit to 6 pounds. The external battery pack was unavailable for testing in time for this review.

Overall, we think the Sharp delivers the best price/performance ratio. With its large VGA display and fast hard-disk access, the PC-6220 matches or exceeds the Toshiba and Compaq machines in a much smaller package. In a PC market that calls every new bell and whistle "innovation," the Sharp deserves notice for advancing the state of the art within its class. Light, powerful, and easy to use, it's a computer that you can take anywhere, without fretting about what you've left behind. ■

Jon Pepper is a free-lance writer based in Sunderland, Mass., and a frequent contributor to *LOTUS*.



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IN BRIEF

Compaq LTE/286. Compaq Computer Corp., 20555 SH 249, Houston, TX 77070; 713-370-0670. Specifications: 12-MHz 80C286 CPU; 20-megabyte hard-disk drive; 1.44-megabyte 3½-inch floppy drive; CGA-compatible LCD display; 640K of RAM; serial, parallel, RGB, and expansion ports; coprocessor socket. Released 10/89. $3,499; 1-year warranty on parts and labor.

Sharp PC-6220. Sharp Electronics Corp., Sharp Plaza, Mahwah, NJ 07430; 201-529-9500 Specifications: 12-MHz 80C286 CPU; 20-megabyte hard-disk drive; VGA-compatible LCD; 1 megabyte of RAM; serial, parallel, and expansion ports; coprocessor socket; DOS 4.01 and *LapLink* in ROM. Released 7/90 $3,995; 1-year warranty on parts and labor. Toll-free technical support.

Toshiba T1200XE. Toshiba America Information Systems, Computer Systems Division, 9740 Irvine Blvd., Irvine, CA 92718; 714-583-3000. Specifications: 12-MHz 80C286 CPU; 20-megabyte hard-disk drive, 1.44-megabyte, 3½-inch floppy drive; double-scan CGA-compatible LCD; 1 megabyte of RAM; serial, parallel, RGB, and expansion ports; DOS 4.01 and *PC-Kwik Power Pak* (from Multisoft Corp.). Released 3/90 $3,999; 1-year warranty on parts and labor.

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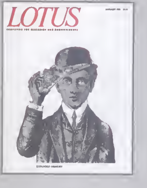

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REVIEWS ✓ ✓ ✓

A Lot of Investment Savvy for a Small Price

These *1-2-3* templates help you evaluate real estate, franchises, and other investments.

BY JIM KINLAN

You have a craving to purchase a home, a car, a fast-food franchise, or the like. But in a fit of common sense, you want to be sure you are making a good business decision before your impulse gets the best of you.

Investimator can help. This software package is a collection of eleven *1-2-3* templates designed to analyze business and real estate acquisitions. The template set is an excellent value, but the eight real estate templates have a decided edge on the three business-acquisition templates in both completeness and functionality.

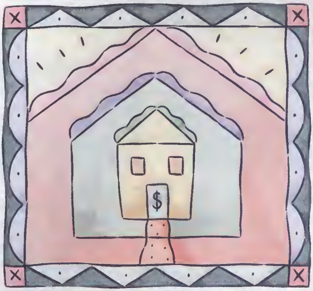
A Standard Format

All the templates share a similar interface. Each model asks for certain details and assumptions, such as purchase price, mortgage rate, loan term, and expected rate of return. These input cells are highlighted on monochrome screens and appear in color on color monitors. The format is easy to understand and use, and for the most part, the manual guides you through each entry with clear instructions and helpful illustrations. Based on the information you enter, the model makes the calculations and formats the data into four financial schedules: a cash flow statement, an income statement, a return-on-investment analysis, and a calculation of net present values. Some of the templates make a recommendation about whether to purchase.

However, the set of templates does contain some annoying shortcomings and inconsistencies. You must install all 11 *Investimator* templates together; you cannot install just the ones you need. This might be a problem for some people because the software requires about 1.3 megabytes of storage. Also, some templates use manual recalculation, while others recalculate automatically.

The Real Estate Templates

The eight real estate templates are invaluable tools for intermediate and advanced investors, and novices can benefit from at least six of them. The simplest template is the Mortgage Qualification Analyzer, which calculates the mortgage amount for which a prospective buyer can qualify. With that information in hand, the next step is to determine what type of mortgage is best: The Fixed vs. Variable Rate Analyzer measures the cash flow differences and the net present values of payments among several options. The only pitfall—and it's unavoidable—is that you must predict interest rates, an exercise that confounds even the the most experienced economists.



BETSEY EVERITT

Before plunging into a house purchase, you might use the Rent vs. Buy Analyzer just to reassure yourself that buying is almost always better than renting. This model takes into account your tax rate and the number of years you expect to own or rent. It compares the appreciation of ownership against the renter's savings in monthly payments, shows the net cash flows and net present value of payments for each option, and recommends a course of action.

The Real Estate Analyzer and the Single Unit/Condominium Analyzer help evaluate investment property. Both templates use assumptions about potential property appreciation, likely rents, and maintenance and other expenses to measure the after-tax return on your investment and to make a purchase recommendation.

The Mortgage Refinancing Analyzer helps you decide when it's worthwhile to refinance a mortgage. The model, which works for both fixed and variable mortgages, considers interest rates, the length of time you expect to hold the property, and the costs of refinancing, such as points and closing fees. Based on the values you enter, the model calculates how long it will take before you break even on the transaction.

The other two real estate templates will appeal to serious investors. Multi-Unit Analyzer and Construction Analyzer evaluate the purchase of a multiple-unit building. Construction Analyzer also considers new-construction costs and the cost of significant renovation to the property in the first year of ownership. Both templates generate a complete loan-payment schedule, operating-income statement, cash flow statement, and they generate a purchase recommendation based on a targeted return on investment.

Business Acquisitions

Three templates make up the business-acquisition group: Lease vs. Buy Analyzer, Business Acquisition Analyzer, and Franchise Analyzer. Lease vs. Buy Analyzer is the easiest to understand and the most straightforward to use. It evaluates all types of capital purchases, such as cars, office equipment, and farm machinery. For example, Lease vs. Buy can determine whether it is more cost-effective to buy a new pickup truck for $24,000 or lease it for $395 a month, based on such assumptions as how long you plan to keep the vehicle, its anticipated resale value, and any extra costs, such as excise and sales taxes.

The Business Acquisition Analyzer appraises the purchase of a small business, such as an ice-cream shop or clothing boutique. Keep in mind, however, that a simple business acquisition can be much more complex to evaluate than a real estate investment or a lease/buy decision. In general, Business Acquisition Analyzer is too simplistic to be useful in evaluating a complex business acquisition but too complex for a novice who is evaluating a simple one.

For example, the model is overly complicated with regard to financing, and a novice user would have difficulty understanding how to arrive at the cost assumptions. In short, neither the design of the template nor its documentation adequately guides users through the process. This model would work better as a stand-alone product with improved documentation and a sharper focus on the types of businesses for which it is suited.

The Franchise Analyzer evaluates the purchase of a specific type of small business—a franchise, such as a McDonald's or a Baskin-Robbins. From estimates of expenses and revenue for the first year, the model generates cash flow and operating-income statements and produces a franchise valuation for the expected year of resale. This template is easier to use than the Business Acquisition Analyzer, but it too suffers from a lack of background material and skimps on the handholding. At a minimum, the documentation could use more real-life examples.

However, it doesn't take all that much to justify a purchase price of $139.95. Particularly if real estate is your focus, *Investimator* offers a speedy and inexpensive way to check the options before making the big deal. ■

Jim Kinlan, former director of new-product marketing at Funk Software, is a consultant based in Massachusetts.

IN BRIEF

Investimator Version 2.0. Jian Tools for Sales, 127 Second St., Los Altos, CA 94022, 800-442-7373. Uses 1.3 megabytes of RAM. Requires DOS 2.0 or higher and *1-2-3* Release 2.01 or higher or a compatible spreadsheet. $139.95. 30-day money-back guarantee; 90-day warranty against defective media.

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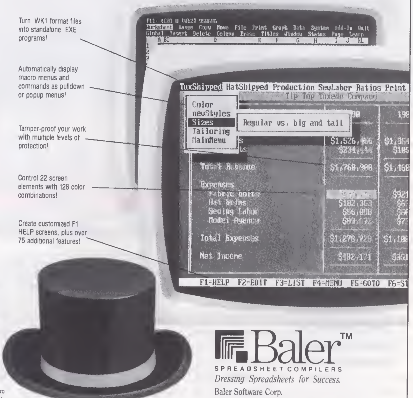

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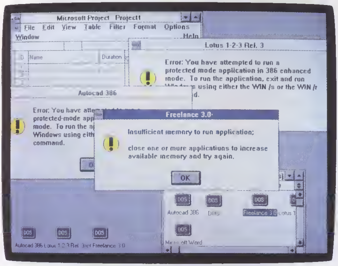
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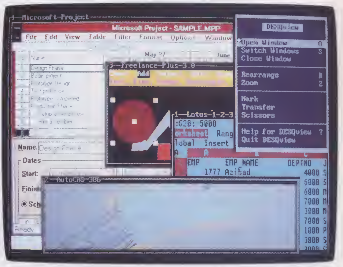
Insufficient memory to run application;

close one or more applications to increase available memory and try again.

Windows 3.0. The multitasking, windowing environment.



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This comparison was made using a system like the one you might run: Both shots show an ALR FlexCache 33/386 running DOS 3.3 with VGA display adaptor, Novell NetWare v3.01 Rev. A, with IPX/SPX v3.01 Rev A, Microsoft Mouse 7.00, and Microsoft SMARTDrive v3.03 disk cache. Buffers were set to 20. For the Windows screen, we ran Microsoft Windows 3 HIMEM.SYS and EMM386.SYS. For the DESQview screen, we ran QEMM 386 v5.1.

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CIRCLE 123 ON READER SERVICE CARD

Lasers for Less

A consumer's guide to 75 low-cost laser printers

BY GARRY RAY

REVIEW *of* REVIEWS

Hewlett-Packard's $1,495 LaserJet IIP set the standard for low-priced, high-quality desktop laser printers. Since the printer's introduction last year, dozens of vendors have flooded the market with small-footprint laser printers priced lower than $2,500. And a deluge of printer reviews have followed to guide the eager but overwhelmed buyer.

For a good overview of low-cost laser printers, see "Laser Printers Get Personal" in the July issue of *Byte* magazine. This thoughtful article doesn't direct readers to the "best" laser printer; it gives them the background to help them decide what to buy. The article includes valuable information on 18 printers that cost less than $3,000. Reviews are grouped according to manufacturer of the printer engine rather than printer vendor, on the reasonable belief that the engine is the most important part of the printer.

The printer engine determines the quality of the printer because the engine includes the sophisticated laser mechanism and the photosensitive printing drum that transfers digital images to paper. This complicated assembly of laser gun, printing drum, rotating mirrors, and other components is far more important to printer performance than the number of LED displays on the printer's control panel. In fact, *Byte* says that "you should select an engine before selecting a particular [printer] model."

Most Dependable Engine

The Canon LBP-LX engine and its variations are, according to *Byte*, the most dependable. They are used in printers from Hewlett-Packard Co., Brother International Corp., NEC Technologies, and Star Micronics America. TEC, the laser engine that costs the least and is the easiest to maintain, is favored in the lower-priced offerings from Desktop Systems, Epson America, Facit, Mannesman Tally, NCR, Packard-Bell Electronics, and Toshiba America Information Systems. The TEC LB-1305B engine also has the advantage of being able to accept a variety of HP font cartridges. Sharp Electronics Corp.'s engine is small, inexpensive, and fast and is at the heart of the printers from Dataproducts Corp., Sharp, and Texas Instruments. Ricoh Corp.'s engine has low maintenance costs but produces fuzzier output. The remaining engines from IBM and Kyocera Unison are generally fast—capable of printing 10 pages a minute—but because they are proprietary, they lack the benefits of being an industry standard, *Byte* reports.

BETSEY EVERITT

Another reasonable point of view proposed by *Byte* is that particular printers are best suited for particular needs. Thus, *Byte* performed three benchmark performance tests on 18 printers, rating each for normal, graphics, and long-document printing capabilities. Not surprisingly, *Byte* found that some printers, feeble in one area, show strength in others. As *Byte* put it: "Know Thy Application." (For specific laser shopping advice, see the sidebar, "Why a $1,000 Laser Printer Might Finally Cost $3,000.")

Still, favorites do appear, with *Byte* preferring all Hewlett-Packard laser printers and the $2,195 Mannesman Tally MT 906. For inexpensive printers, *Byte* favors those with the Sharp engine, most notably Texas Instruments' microLaser, which costs $1,799.

The June *PC Digest Ratings Report* (*PCDRR*) covered a similar batch of low-cost printers. These printers' features and performances were carefully scrutinized by the National Software Testing Laboratories. With performance being the deciding issue, printers using the low-cost TEC engine appeared near the bottom of the 11-printer comparison. Garnering the top three spots were IBM's LaserPrinter E ($1,495), Qume Corp.'s CrystalPrint Super Series II ($1,999), and HP's LaserJet IIP.

12,000 Pages a Month

Boosting the LaserPrinter E to the number one spot is its ability to print 12,000 pages a month, compared with 2,500 to 6,000 for other printers. Another reason for its top position is that it emulates the Hewlett-Packard LaserJet Series II and supports IBM's Proprinter Graphics Format and the HP Graphics Language for plotters.

The LaserPrinter E was also lauded for its ability to expand to a full PostScript printer for an additional $948.

PCDRR cited the Qume printer for excellent overall performance and its high-quality output. Ranking third in the *PCDRR* is the HP LaserJet IIP, which was noted for its high-quality graphics and text output. Considering that printer vendors have had nearly nine months to produce a printer to surpass it, the LaserJet IIP's third-place rating stands even stronger.

PC Magazine's June 12 issue has a review of nine low-cost laser printers that sell for less than $1,700. Topping the list of the Editor's Choice is, not surprisingly, the LaserJet IIP, which *PCM* says is "the best value among low-end lasers." The $1,395 OkiLaser 400 also made Editor's Choice because it "includes the equivalent of six HP font cartridges" built in. However, it won't accept other HP font cartridges. The Epson EPL-6000, Facit P6060, and Toshiba PageLaser6 printers, which are also recommended, do accept other HP font cartridges.

IBM's LaserPrinter E wasn't delivered in time to be included in *PCM*'s review, but the printer was deemed important enough to be reviewed independently and appeared as a sidebar to the June 12 article. *PCM* concurred with other magazines in calling the LaserPrinter E "an excellent buy," based on general performance, expandability, and output quality. The $1,495 price, says *PCM*, guarantees that this IBM offering will "gobble a big portion of the low-end laser market."

The Hot New HP LaserJet III

However, *PCM* strongly recommends that you shouldn't buy a thousand-dollar laser printer until you've seen the scalable-font Hewlett-Packard LaserJet III, which lists for $2,395 and can sell for as low as $1,500. *PCM* says that "Hewlett-Packard's PCL 5 (which provides the LaserJet III's scalable-font technology) is emerging as the 800-pound gorilla of the printer industry." PCL 5 brings you most of the advantages of PostScript printers for about two-thirds the cost. Says *PCM*: "At present, no other 300-dpi laser matches the LaserJet III for print quality."

Personal Computing magazine tested a number of low-cost lasers during its waning months. Its findings culminated in positive write-ups of the LaserPrinter E and the Mannesman Tally MT 906 in its next-to-last issue, dated July 27. The MT 906 is noted for its ability to print graphics at a brisk pace, owing to its proprietary printer-controller circuitry. *Personal Computing* notes that heavy graphics users may be able to "forestall the purchase of a more expensive printer." And the IBM, says *Personal Computing*, is a "strong alternative to a dot-matrix printer for anyone on a budget."

Being an affordable alternative to dot-matrix printers is essentially the point of all these printers. When desktop laser printers became available six years ago, the high-priced, noisy, and inconvenient daisy-wheel printer quickly vanished. Now, with the price of laser printers dropping to the $1,000 mark, the future of dot-matrix printers may not be as bright as it once appeared.

WHY A $1,000 LASER PRINTER MIGHT FINALLY COST $3,000

Sorting through the scores of laser printers to find the one best suited for your projects and your purse becomes more manageable if you focus on what you want to print. If you print a lot of complex spreadsheet-generated graphs and you use *Allways* or *Impress* to enhance your worksheets, be aware that the rock-bottom advertised special may not have enough speed, memory, and processing power for the job. Not only must you decide what your printing needs are today, but you should consider future requirements, as well.

The first concern is, of course, the base price of the unit versus the price of a machine equipped to do what you want done. Most of the low-cost units that are discussed in the article require additional memory to produce graphics. Specifically, a single page of 300-dots-per-inch, high-resolution graphics requires about 1 megabyte of printer memory. If you don't have enough memory, you'll be forced to generate lower-quality images. Given that most printers come with 512K of RAM, it's almost guaranteed that you'll have to pony up another $500 for additional memory.

Of course, if you'll be printing only text documents, memory probably won't be much of a concern. Most printers include from two to five resident typefaces that don't require the memory overhead of graphics jobs. Text output is constructed in the printer's memory, one line at a time, as it is being printed and thus doesn't need much memory.

But if the typefaces you want don't come with the printer, you'll have to use either "soft" fonts or plug-in cartridges that contain the additional fonts. Such cartridges generally cost about $100 to $150. The other route, downloading "soft" fonts from your hard disk to printer memory, is a good alternative but requires the additional printer memory mentioned above. Printers, such as those with the TEC printer engine, have little difficulty accepting any of the wide range of HP font cartridges.

Another consideration is the industry-standard PostScript language. PostScript is popular because of its enormous range of high-quality typefaces and its ability to handle complicated graphics chores. Both properties are possible because PostScript is actually a language that is interpreted and executed within the printer. Your computer software sends a PostScript file—not the entire graphic image—to the printer, which then decodes it and generates a page image in printer memory. An added advantage is that any PostScript file can be printed on any PostScript device, regardless of the brand of computer or software used to create the file.

Of course, PostScript isn't cheap, and it's not available for all the printers mentioned here. Typically, a PostScript upgrade, generally a plug-in card or circuit board, costs $500 to $1,500 and requires about 3 megabytes of printer RAM. Thus, your low-cost laser could become a $3,000 investment, although still less expensive than many of the "pure" PostScript printers—those that have Adobe Systems' page description language built in. *—G. R.*

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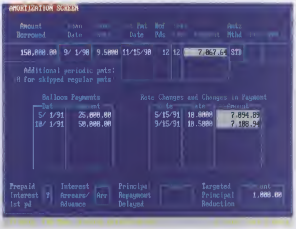
CIRCLE 125 ON READER SERVICE CARD

GET AN EDGE ON INTEREST CALCULATIONS

PercentEdge Finds The Best Loan Terms



```
AMORTIZATION SCREEN

 Amount      oan              t Pmt  Nof                 Amtz
 Borrowed    Date               Date  Pds                Mthd

 150,000.00  9/ 1/90  9.5000 11/15/90   12 12   7,067.64 STD

    Additional periodic pmts:
  0 for skipped regular pmts

       Balloon Payments             Rate Changes and Changes in Payment
     =Dat           nt                  te         ate     =Amount
      5/ 1/91   25,000.00             5/15/91  10.0000     7,094.89
     10/ 1/91   50,000.00             9/15/91  10.5000     7,108.94

Prepaid        Interest        Principa          Targeted        unt
Interest  Y    Arrears/  Arr   Repayment         Principal     1,000.00
1st pd         Advance         Delayed           Reduction
```

PercentEdge allows for multiple amortization scenarios and "creative financing" options.

In these volatile economic times, interest rates can mean everything. The rise and fall of Donald Trump, the crash of Drexel Burnham Lambert, and the ongoing savings-and-loan scandal all reflect poor assumptions and bad judgment about borrowed money.

Fortunately, those doing business on a less grandiose scale can find a measure of protection in *PercentEdge*, Timeslips Corp.'s low-cost program that calculates interest rates. *PercentEdge* covers four essential facets of the interest-rate game: mortgage, amortization, present value, and variable rate. The program supplies a single screen for each of these four types of calculations, along with a fairly straightforward reporting facility. And because of its simple but well-conceived design, *PercentEdge* is equally applicable to business and personal matters.

Take a simple car loan. Say you want to finance at the dealer's below-market interest rate, but the $2,000 cash-back offer is tempting, as well. Pop into *PercentEdge*, punch the two scenarios into its Mortgage screen (which can be used for any type of loan), and in seconds you'll see a precise, to-the-penny comparison of the two alternatives.

The Mortgage screen can be used to examine many alternative approaches to a mortgage, showing the financial impact of the initial down payment, the interest rate, or the total life of the loan. Like all the *PercentEdge* computational screens, the mortgage calculator is essentially a specialized what-if calculator.

The Amortization screen answers questions about the repayment of loans and mortgages. It can handle calculations involving balloon payments, moratoriums on principal, graduated and changing interest-rate schedules, staggered loan payments, targeted principal reductions, and a host of less common "creative financing" alternatives.

To play what-if games with the amortization numbers, you supply three of four variables and *PercentEdge* calculates the fourth. For example, if you enter the loan amount, repayment period, and interest rate, *PercentEdge* supplies the payment amount. Enter the loan amount, repayment period, and your targeted monthly principal reduction, and the program shows the length of the loan. From the loan amount, periodic-payment amount, and loan period, *PercentEdge* calculates the true interest rate. Tabular reports can be printed or saved to disk as word-processing files or WK1 files.

PercentEdge's Variable Rate screen can be used to calculate interest accrual on bonds, savings accounts, and interest-bearing loans (although the Amortization screen is more flexible for loan calculations). The primary difference between this and other sections of the program is that the Variable Rate screen will accept multiple, interdependent scenarios. You might, for instance, want to calculate the total value of a five-year financial instrument whose interest rate is pegged to the prime rate and refixed each year. To do so, enter the principal amount and the five yearly rates; *PercentEdge* calculates the yearly and final value of the instrument. Change the rate for a single year, and the entire value is recalculated.

Another *PercentEdge* screen covers present values and cash flows. It is useful in any situation that requires comparative

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analysis of the value of something today versus its potential value in the future. A simple example is the value of the down payment on a house: Is it better to make a 20% down payment today and pay 10% interest on the balance or to put 10% down and invest the rest in a certificate of deposit?

Along the same lines, would it be better to accept a lump-sum distribution on an insurance settlement or to receive monthly payments over a fixed period of time? These and other questions related to the time value of money can be answered in the *PercentEdge* Present Value screen.

All of *PercentEdge*'s interest-rate scenarios conform to standard American accounting procedures for interest calculations. However, an extensive options screen lets you specify less-conventional financing standards: Prepaid first-period interest, interest in advance or arrears, 360- or 365-day calendars, and the Canadian rule governing six-month interest accrual are just a few of the settings you can choose.

While it's true that with a little perseverance you could produce most of *PercentEdge*'s calculations in a *1-2-3* worksheet, if you don't have the time or if you want a single program that performs these calculations quickly, easily, and in full accordance with standard accounting practices, then the $99.95 price tag on *PercentEdge* is a bargain. —*Garry Ray*

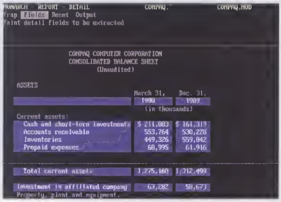
PercentEdge. Timeslips Corp., 239 Western Ave., Essex, MA 01929; 508-768-6100. Requires a hard disk and 320K of expanded memory or a RAM disk to run as a TSR program. $99.95. 30-day money-back guarantee if purchased directly from Timeslips Corp.

CIRCLE 1 ON THE READER SERVICE CARD

Monarch: A Bridge to Software Compatibility

No man is an island, said John Donne, but software developers still haven't gotten the message. Too many of today's applications produce data that cannot be used with another program. We've all had experience with the accounting package that doesn't export data, the loan-amortization program that won't print to disk, or the financial-analysis software that displays reports only on-screen.

Of course, an increasing number of applications support *1-2-3* by producing Lotus worksheet files or PRN files or both. But for those recalcitrant packages that remain unaware of *1-2-3*, Personics Corp.'s new *Monarch* utility should solve a number of problems.



```
ONARCH - REPORT - DETAIL                    COMPAQ.              COMPAQ.MOD
rap  Fields  Reset  Output
aint detail fields to be extracted

                  COMPAQ COMPUTER CORPORATION
                  CONSOLIDATED BALANCE SHEET
                          (Unaudited)

  ASSETS
                                        March 31,    Dec. 31,
                                          1990         1989
                                            (in thousands)
  Current assets:
    Cash and short-term investments   $ 211,003   $ 161,313
    Accounts receivable                 553,764     530,228
    Inventories                         449,326     559,042
    Prepaid expenses                     68,995      61,916

    Total current assets              1,275,168   1,312,499

  Investment in affiliated company       63,282      58,673
  Property, plant and equipment.
```

***Monarch* lets you** specify the data you want to extract and describe its characteristics. In this income statement, the detail lines are highlighted.

Monarch can turn almost any financial report into a row-by-column format suitable for use in *1-2-3* or in any program that can read *1-2-3* files. However, *Monarch* needs to know precisely how the source report is constructed, where the salient data is located, and what kind of data it is. That sounds fairly simple, but reports often rely for their logical flow on visual cues, such as uppercase and lowercase letters, minor column indentations, and variations in line spacing. To make *Monarch* work, you first have to identify and describe those subtleties in ways that the program can understand. *Monarch* is well designed and competent, but translating a complex report format into the program's lingua franca can be daunting.

Getting *Monarch* to read a report, however, is easy. *Monarch* can read standard text files created by the source program or captured by the Vprint utility included in the package. Vprint diverts report output from the printer to a disk file that *Monarch* can read. The utility also captures on-screen data using the computer's PrintScreen routine.

The next step is to tell *Monarch* how the source report is constructed and which data is important. The program's menu-driven interface makes it fairly simple to specify the report structure, including repeating headers and footers, detail lines, and up to three break levels. To understand these terms, imagine an income statement, such as the one in the figure. The first break level might include the headings *Assets*, *Liabilities*, and *Stockholders' Equity*; the second break level comprises the groups of line items under those headings. The detail lines are the individual line items under each heading. For example, *Accounts Receivable*, *Inventories*, and *Prepaid Expenses* are detail lines under *Assets*.

Note, however, that the detail lines in the source report must have a columnar or repetitive structure to be suitable for *Monarch*. Long report lines with no discernible structure might have to be restructured in a text editor before *Monarch* can process them.

After you indicate the nature of the data you want *Monarch* to extract—that is, whether it is from a break level, a detail line, or possibly a header or footer—you highlight, or "paint," the data to specify its columnar position and length. Finally, you indicate the data type. *Monarch* can distinguish between character, numeric, blank, and user-specified data. To extract user-specified data, *Monarch* requires an exact match between the specified string and a report string. The result is a row-by-column view of the data needed from a report.

Monarch's Table view lets you further refine data selection and extraction. In the Table view, you can establish simple or complex criteria that select items according to numeric values or character strings. In a customer database, for example, a simple criterion might select only those items that contain the string *Oyster Oil Company*. A more complex criterion

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might select all records whose *Order Amount* field is greater than $10,000 but less than $50,000.

The Table view also lets you rearrange or exclude columns and change data types. That can be handy. For example, if you discover that one of the numeric columns contains some alphabetic characters, you simply respecify the data type as alphanumeric.

If the Table view is too detailed, *Monarch* can rearrange data into cross-tabulated, or summary, views. This view distills the data to give you an entirely new perspective on a report. Rather than look at every order from every customer, you might want to look at all of the customers and their gross purchases. The summary view, in essence, compresses all the detail lines into a single entry.

No data is changed in the original report during any of these operations; *Monarch* creates a "model" file to receive the changes and leaves the source report intact. However, since the whole point of *Monarch* is to get otherwise incompatible data into *1-2-3*, you can easily convert each of these views to a WKS or a WK1 file by using the Output command. The result is a bona fide *1-2-3* worksheet file, complete with *1-2-3* cell formats and other attributes. *Monarch* can also produce files in *dBase III Plus* format (including field names) and in TXT and delimited ASCII formats.

In sum, *Monarch* takes some time to learn, but it should be well worth the effort to anyone stuck on an island of his own program's making. *—G. R.*

Monarch version 1.0. Personics Corp., 63 Great Rd., Maynard, MA 01754; 508-897-1575. Runs on IBM PCs and compatible computers. Requires DOS 2.0 or higher and 512K of RAM. Released 6/90. $495. 30-day, money-back guarantee.

CIRCLE 2 ON READER SERVICE CARD

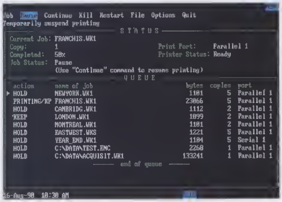
P.D.Queue Speeds Your 1-2-3 Print Jobs

Computers are getting faster, software more powerful, and spreadsheets more complex, but most dot-matrix printers are still stuck in first gear. Thus the arrival of Funk Software's newest product: *P.D.Queue*, a print-spooling add-in that turns off *1-2-3*'s and *Symphony*'s WAIT light.

P.D.Queue works with *1-2-3* Release 2.*x* and *Symphony* Release 1.1 or higher. It can handle any *1-2-3* output on any printer, including unadorned worksheets, worksheets enhanced by *Allways*, *Sideways*, or *Impress*, and printer (PRN) files. *P.D.Queue* is best used, however, on older, slower, dot-matrix printers, rather than on laser printers.

Whenever the size of a worksheet's print file exceeds the capacity of the printer's buffer, *1-2-3* and *Symphony* become stalled in WAIT mode. You can't do any more work until the print job ends. Depending upon the size of the worksheet, the speed of the printer, and the size of its print buffer, the delay can range from a few seconds to a few hours. During that time, access to *1-2-3* is impossible.

P.D.Queue changes that dramatically. Acting as a way station between *1-2-3* and your printer, *P.D.Queue* intercepts print jobs, sends them temporarily to your hard disk, and controls the speed and order in which they are printed. All of this, of course, takes place entirely in the background. The only thing you notice is how fast your WAIT indicator turns off.



```
ob  Pause  Continue  Kill  Restart  File  Options  Quit
emporarily suspend printing
─────────────────────── S T A T U S ───────────────────────
 Current Job: FRANCHIS.WK1
 Copy:        1                        Print Port:     Parallel 1
 Completed:   50%                      Printer Status: Ready
 Job Status:  Pause
              (Use "Continue" command to resume printing)
                            Q U E U E
  action      name of job                      bytes  copies  port
▸ HOLD        NEWYORK.WK1                       1101       5  Parallel 1
  PRINTING/KP FRANCHIS.WK1                     23066       5  Parallel 1
  HOLD        CAMBRIDG.WK1                      1112       2  Parallel 1
  KEEP        LONDON.WK1                        1099       2  Parallel 1
  HOLD        MONTREAL.WK1                      1101       2  Parallel 1
  HOLD        EASTWEST.WKS                      1221       5  Parallel 1
  HOLD        YEAR_END.WK1                      1104       5  Serial 1
  HOLD        C:\DATA\TEST.ENC                  2268       1  Parallel 1
  HOLD        C:\DATA\ACQUISIT.WK1            133241       1  Parallel 1
                     ────── end of queue ──────

6-Aug-90  10:30 AM
```

P.D.Queue provides extensive printing options for one or more *1-2-3* or *Symphony* worksheets and speeds up dot-matrix printers.

P.D.Queue is also handy for network users. Its ability to intercept, hold, and redirect print jobs is very helpful for those who frequently switch from one network printer to another or between network printers and local, desktop printers. And *P.D.Queue* can selectively or automatically retain all queued jobs for future use, so you don't have to invoke *1-2-3* print commands to reprint a particular worksheet. Other options let you delete or delay print jobs.

Most of *P.D.Queue*'s options focus on print-queue management: the placement of a print job in the queue; the disposition of a file after printing; the number of copies to be printed; and the interruption, resumption, or completion of a job. All of these commands are available from a simple and easily understood menu. Print jobs are shown in a window beneath the command menu and are generally organized in the order in which they were directed to the printer. Working with a print job is as easy as highlighting the job and selecting the appropriate commands from the menu. Moving and deleting a job in the print queue is just as easy.

P.D.Queue causes no serious problems in *1-2-3* or *Symphony* performance, even while it is spooling a print job from disk to printer. Its background actions become evident when it scrolls or moves the cursor through a worksheet, but weighed against the option of no worksheet access, *P.D.Queue*'s use of additional RAM is insignificant. It requires only 36K of RAM and enough hard-disk space to temporarily hold print jobs.

Print-spooling programs are not new, nor are they useful for every spreadsheet printing problem. But for those who want greater flexibility, *1-2-3* and *Symphony* compatibility, and more punch from their printers, *P.D.Queue* may be the answer.

—G. R.

P.D.Queue version 1.0. Funk Software, 222 Third St., Cambridge, MA 02142; 800-822-3865. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers with a hard-disk drive. Requires *1-2-3* Release 2.*x* or *Symphony* Release 1.1 or higher and 36K of additional RAM. $89.95. 30-day, money-back guarantee.

CIRCLE 3 ON READER SERVICE CARD

ENGINEERING, SCIENTIFIC

Templates for MathCAD

Mechanical- and chemical-engineering packages are now available for *MathCAD*, a program for calculating, solving, and documenting technical problems. Two packages are for mechanical engineers. One includes 15 structural-design applications; the other includes 13 applications for machine design, fluid flow, and heat transfer.

Requires *PC MathCAD* 2.0 or above; DOS 2.1 or higher with 640K of RAM, Macintosh Plus or later with 1 megabyte of memory (2 megabytes for the chemical pack), or SunOS 4.0 or higher; and a Sun-3, Sun-4, or SPARC station workstation. $99, from MathSoft, 201 Broadway, Cambridge, MA 02139; 800-MATHCAD, in Massachusetts 617-577-1017.

CIRCLE 4 ON READER SERVICE CARD

NETWORKING

Put a New Face On Mainframe Programs

HyperHost is a PC-based user interface that lets developers create easy-to-use front-ends for existing mainframe and minicomputer applications. The environment is object-oriented and includes a scripting language and screen-management capabilities. The product works with any mainframe software that produces output that can be displayed on the screen. Logic for screen handling, field editing, validation, error processing, and help-screen management is executed on the PC.

Requires DOS 2.1 or higher; 640K of RAM; and an Irma board, an IBM 3270 Emulation Board, an IBM Enhanced 5250 Display Station Emulation, or an IBM-compatible LAN gateway. $17,500 for as many as 100 users, from Brightbill-Roberts & Co., 120 E. Washington St., Suite 421, Syracuse, NY 13202; 315-474-3400. 30-day money-back guarantee, 90-day warranty against defective disks and documentation.

CIRCLE 5 ON READER SERVICE CARD

ANDREA FARACLAS

HARDWARE

Pocket Modem That Includes Fax Software

The Smart One Traveler is a 2,400-bit-per-second (bps) battery-powered pocket modem that can send messages to fax machines. Included with the product are communications and facsimile software, a 9-volt battery and external AC power supply, LED lights, a speaker, and an RS-232 pin connector that you can attach directly to laptop or desktop computers. The Traveler transmits ASCII text, as well as PCX, TIFF, and IMG files to a fax by converting them to a bit-mapped format. It operates in the background and can send messages to multiple destinations.

Requires DOS 2.1 or higher and 256K of RAM or a Macintosh SE or later with 1 megabyte of memory. $299, from Best Data Products, 9304 Deering Ave., Chatsworth, CA 91311; 818-773-9600. 2-year warranty on parts and labor.

CIRCLE 6 ON READER SERVICE CARD

Portable Floppy Drives

The Backpack is a new line of external floppy drives that are installed by plugging them into a standard parallel-printer port; no interface card is required. Each unit contains a printer port, so printer access is not affected. Proprietary software included with the product lets you format disks as a background task.

Requires DOS 2.0 or higher. $349 for 3½-inch 1.4-megabyte or 5¼-inch 360K or 1.2-megabyte models; $425 for 3½-inch 2.8-megabyte model. From Micro Solutions Computer Products, 132 W. Lincoln Hwy., DeKalb, IL 60115; 815-756-3411.

CIRCLE 7 ON READER SERVICE CARD

Font Cartridge Prints 6-Point Spreadsheets

You can print a 40,000-character spreadsheet on one letter-size page with the 30-pitch Lotica fonts available in the JetWare SuperSet+ cartridge for HP LaserJet printers. Among the cartridge's 425 fonts are Linotype Helvetica and Times typefaces in 6- to 18-point sizes, as well as fixed-pitch Courier, Prestige Elite, Presentation, Letter Gothic, and Dingbat fonts in a variety of portrait- and landscape-mode sizes. Printer drivers are included for *1-2-3*, *Microsoft Windows* 3.0, along with many word-processing and desktop-publishing applications. (Magnifying glass not included.)

Requires DOS 2.0 or higher and an HP LaserJet Series II, IID, IIP, or III printer. $449, from Computer Peripherals, 667 Rancho Conejo Blvd., Newbury Park, CA 91320; 800-854-7600, in California 805-499-5751. 5-year warranty on parts and labor.

CIRCLE 8 ON READER SERVICE CARD

Increase PC Memory to 896K of RAM

Hicard2+ is a package that combines a 256K 8-bit memory card with software to free usable DOS memory above 640K. It provides up to 896K of memory in 8088-, 8086-, and 80286-based PCs with a minimum of 640K of memory installed. Device and network drivers, background utilities, and terminate-and-stay-resident programs are loaded into memory above 640K.

Requires DOS 2.0 or higher and 640K of RAM. $349, from RYBS Electronics, 2590 Central Ave., Boulder, CO 80301; 303-444-6073. 2-year full warranty.

CIRCLE 9 ON READER SERVICE CARD

Switch Detects Voice, Fax, or Computer

ComSwitch 200 and ASAP TF 555 are fax switches that can be connected simply by plugging them into any telephone wall jack. The ComSwitch 200 connects an incoming call to a fax machine if the phone is not answered after the fourth ring. The ASAP TF 555 is more sophisticated and is capable of automatically transferring an incoming call to a telephone, a facsimile machine, an answering machine, or a computer by reading the incoming signal. It can also be programmed to screen fax junk mail and to use security codes with ring-back options.

Requires a telephone jack. $89 for ComSwitch 200; $199.95 for ASAP TF 555. From Command Communications, 10800 East Bethany Dr., Suite 300, Aurora, CO 80014; 800-288-3491, in Alaska, Hawaii, or Canada 303-750-6434. 90-day limited warranty on parts and labor for ComSwitch 200, 2-year limited warranty for ASAP TF 555.

CIRCLE 10 ON READER SERVICE CARD

Tandy Enters Home Market—Again

The Tandy 1000 RL is an 8086-based 9.54-MHz personal computer designed for the home market. It features a graphical user interface and includes 24 simple, home-oriented programs, such as an electronic grocery list, a checkbook register, and an address book. Sound can be recorded and played back. The basic computer comes with 512K of RAM, a 720K floppy-disk drive, and a monochrome monitor. Among the options are a hard disk, a color monitor, a joystick, a clock, and a mouse.

$749.90 to $1,299.90, from Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011. Sold at Radio Shack stores. 1-year warranty on parts and labor.

CIRCLE 11 ON READER SERVICE CARD

Low-Cost Laser Meets Low-Cost PostScript

The QMS-PS 410 is a PostScript/HP-PCL laser printer intended for small work groups and single users. It prints four pages per minute and uses a 68020 controller operating at 16.67 MHz. It's shipped with 2 megabytes of RAM, expandable to 6 megabytes, and 45 resident Adobe Systems typefaces. An emulation-sensing processor analyzes incoming data and automatically switches modes between PostScript and HP-PCL emulation. An HP-GL emulation card is optional. The printer can receive data simultaneously from its parallel port, serial port, and AppleTalk interface.

Requires any platform that uses PostScript, HP PCL, or HP-GL. $2,795 (HP-GL card, $295), from QMS, One Magnum Pass, P.O. Box 81250, Mobile, AL 36689-1250; 800-631-2692. 1-year warranty.

CIRCLE 12 ON READER SERVICE CARD

Zoom Releases Fax Modem

The Zoom/Modem is a 2,400-bps modem that can send a file as a fax document. It can also transmit any file that can be output to an IBM Proprinter or Epson dot-matrix printer. It comes in both internal half-card and external models and is fully Hayes-compatible. Among the fax file formats it supports are ASCII, PCX, TIFF, TIFF Bi-Level, BFX, DCX, and Pad-Bit.

Requires DOS 2.0 or higher and 640K of RAM. $199, from Zoom Telephonics, 207 South St., Boston, MA 02111; 617-423-1072. 7-year warranty.

CIRCLE 13 ON READER SERVICE CARD

PROGRAMMING

ToolBook Utilities Aid Developers

The Asymetrix ToolBook Author's Resource Kit is a software construction set that lets users and developers build custom graphical applications to use with *Windows*, without using traditional programming languages. It contains development utilities for working with DOS, *Windows*, and *dBase* files and includes a license that permits authors to distribute a run-time version of *ToolBook* (royalty-free) with their applications.

Requires an 80286-, 80386-, or 80486-based PC, DOS 3.1 or higher, 1 megabyte of RAM, a 1.2-megabyte 5¼-inch or 720K 3½-inch floppy-disk drive and a hard disk, *Tool Book* 1.0, *Windows* 3.0, and a *Windows* 3.0-compatible mouse. $450, from Asymetrix Corp., 110 110th Ave. NE, Bellevue, WA 98004; 206-637-1500.

CIRCLE 14 ON READER SERVICE CARD

Low-Cost Computer-Aided Instruction

PC-CAI version 2.0 is a computer-assisted instructional language that allows teachers to create computer-driven tutorials, tests, and demonstrations. Features include support for sound, music, graphics, and animation effects. The program includes a menu-driven program that lets you create programs without writing any code.

Requires DOS 2.1 or higher and 512K of RAM. $49, from TexaSoft, P.O. Box 1169, Cedar Hill, TX 75104; 214-291-2115. 30-day money-back guarantee.

CIRCLE 15 ON READER SERVICE CARD

UTILITIES

Virus-Detection Program from John McAfee

ViruCide, written by John McAfee, chairman of the Computer Virus Industry Assocation, finds and destroys computer viruses is menu driven, searches every file, detects and removes viruses, and generates reports on its findings. A 236-page book on viruses comes with the program.

Requires DOS 2.0 or higher and 256K of RAM. $49, from Parsons Technology, 375 Collins Rd. NE, Cedar Rapids, IA 52402; 800-223-6925. 30-day money-back guarantee.

CIRCLE 16 ON READER SERVICE CARD

Replacement for Windows Print Spooler

Faster printing under *Windows* 2.1 and 3.0 and PostScript-quality output on non-PostScript printers are offered by *SuperPrint*, a new utility that works from within *Windows*. The utility includes SuperText Manager, which generates WYSIWIG screen fonts, and SuperQue, a utility that frees your PC for other tasks. It is shipped in printer-specific versions for Hewlett-Packard, CalComp, Tektronix, and Mitsubishi Electronics America printers, plus Presentation Technologies film recorders. It includes 22 scalable typefaces.

CIRCLE 17 ON READER SERVICE CARD

Requires *Windows* 2.1 or 3.0. $195 for Hewlett-Packard LaserJet, DeskJet, and PaintJet printers; $395 for other versions. From Zenographics, 4 Executive Park Circle, Irvine, CA 92714; 714-851-6352. 90-day warranty against defective media.

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Requires DOS 2.1 or higher and 256K of RAM. $89.95; users of previous shareware versions of the product can upgrade for $24.95. From System Enhancement Associates, 925 Clifton Ave., Clifton, NJ 07013; 800-899-4732. 30-day money-back guarantee.

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Information for New Products is supplied by the vendors and was up-to-date as of this writing. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase.

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ESSAY

Don't Overlook the LAN User

BY LINDA KURAMOTO

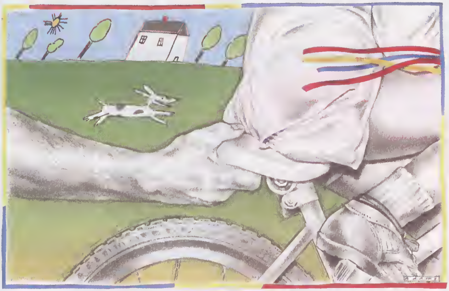
When a company decides to install a local area network, the information-systems staff usually starts by working on the issues of development and operation—protocols, operating systems, and transport mechanisms. Equally important and often overlooked, though, are the concerns and objectives of the employees and managers who will use the LAN. However technically slick it is, the LAN won't be a success if it doesn't have the support of those who must use it.

To users of a stand-alone PC, being tied into a LAN means big changes—changes in the way they do their jobs and the way they use their computers. Users have to give up familiar and comfortable ways of working for new and unknown ones. Most often they are asked to take it on faith that the benefits of the LAN will be worth the compromises, the trade-offs, and the difficulties of adjustment. Open communication is the best method for smoothing the transition process, and a good place to begin is to acknowledge users' natural resistance to change and to understand their concerns and fears.

It's an inescapable fact of life: LANs require that users follow some fixed procedures, a burdensome prospect for those who have grown up in an unrestrained stand-alone PC environment. Even the most basic procedures, such as logging on and off the network, using passwords, and queuing up to use a shared laser printer, will be annoying.

For neophyte LAN users, the shift in perspective from the individual to the department or work group forces them to relinquish some or all of the control they have with their own PCs. Users may worry about whether others will have access to their files or whether they will have to share their printer when it becomes part of the LAN.

Furthermore, they don't want to give up their favorite applications and their accustomed ways of working. But in many cases, users won't be able to run their present stand-alone programs the same way. For example, people who now use direct commands to access the company mainframe may suddenly have to wade through a series of menus on the LAN. Or, to use the LAN most efficiently, all managers may be required to construct their budgets in the same way and with the same format. In extreme cases they may be asked to adopt a new application altogether.



LISA ADAMS

Then there are the old bugaboos: reliability, support, and cost. In the stand-alone PC world, users can diagnose and solve some problems themselves, a much less likely prospect in a LAN environment. And managers may have concerns about who's going to pay for the LAN, particularly if the cost will be charged to their departmental budgets.

A few important steps can go a long way toward making a LAN successful. To prevent LANophobia, introduce users early to the concepts of LANs and focus on the benefits, particularly file- and resource-sharing, enhanced communications, and freedom from maintenance chores such as data backup. When you emphasize the increased productivity derived from LANs, be specific.

Invite users into the planning process and encourage them to participate in establishing requirements. When users feel involved, they'll accept the LAN as their own. And when users feel that the LAN is for them rather than imposed on them, they will have more patience during the transition and be more tolerant of the trade-offs they must make.

Plan well for support. Make sure users know who is responsible for what, who to call when things go wrong, and how long it will take for help to arrive.

Finally, listen carefully to users' suggestions and act on them. Then make sure you deliver on your promises.

Linda Kuramoto is a senior associate with the Boston Systems Group, a Boston-based consulting and systems-development firm.

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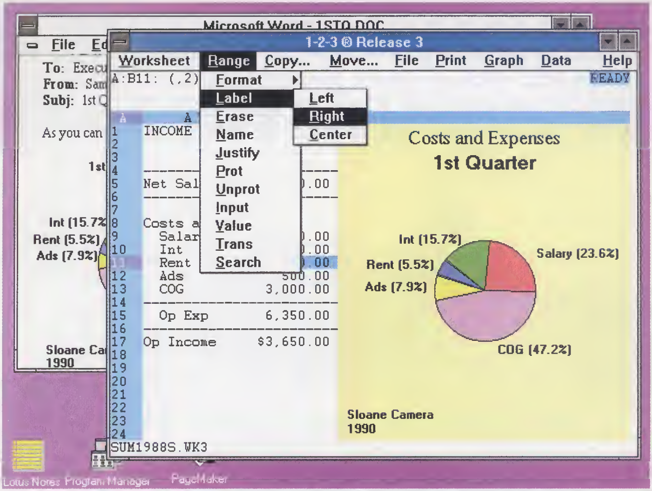

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